# Second Thousand Answered Questions in California Agriculture

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By E. J. WICKSON

Emeritus Professor of Horticulture, University of California; Editor of the Pacific Rural Press of San Francisco; Author of "California Fruits and How to Grow Them," "California Vegetables in Garden and Field," "California Garden-Flowers, Shrubs, Trees and Vines," Etc.

*A Sequel to "One Thousand Questions in California Agriculture Answered."*

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# PREFACE

The earlier publication of this series, entitled "One Thousand Questions in California Agriculture Answered," met a keen demand and an edition of five thousand copies was sold in less than two years. In order that those who find that book useful may have additional information as soon as possible, it has been thought best to publish answers to another thousand questions before undertaking a revised edition of the first thousand. This book is therefore in no sense a revision or republication of its predecessor. Particular care has been taken that nothing in this volume shall be a duplication of the preceding one, and the reader therefore needs both of them, twice as much as he needs either of them.

The compiler is thoroughly gratified that this branch of his work is found to answer so good a public purpose and he cannot refrain from stating that the way to secure just such information from week to week is by subscription to the Pacific Rural Press.

E. J. WICKSON.

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# PART I. FRUIT GROWING

### Trees Do Not Grow Up.

*A friend is setting twenty acres of walnuts, and is going to head them two feet from the ground, so that when they reach maturity the head will be four feet from the ground. Have you found this to be so or would you rather head them at four feet to begin with?*

Your friend is wrong in the head. A tree does not grow up from the ground. Unless some one shifts the ground in cultivation or otherwise, the head draws nearer to the surface because the branches enlarge in diameter. That is, the center of each branch remains just where the bud, from which it grew, started on the stem; the lower side being nearer the ground, therefore, by one-half the diameter of the branch. This amounts to a great deal with trees which reach such size and thickness of limb as the walnut and fig. If you wish the lowest limb something less than four feet start the limb at four feet and the under-side of it will draw nearer to the ground later.

### Growing Fruit Trees in Alfalfa.

*How shall I plant alfalfa in a young orchard? The ground was leveled before trees were planted, but will require checking now to control the water. If I throw up border checks along the tree rows will this work any injury to the trees from being in the ground that much deeper?*

It depends upon the kind of soil and how much deeper. It is less dangerous in a light soil, but if there is much dirt shifted around the tree it usually does harm. In such a case the tree should have been planted a little higher, and yet not so high as to be liable to injury on a dry levee. But trees in alfalfa should usually have a cultivated strip to themselves, at least while young, the levee being turned up three or four feet from the trees.

### Sour Sap in the Root.

*My peach trees put out a few leaves and then within a few days the leaves turned brown and dry before unfolding. Some of the trees set out last spring died. The trees planted two years ago are first showing it now.*

There has been too much water standing in the soil. It has destroyed the root-hairs and they could not furnish sap to keep up the growth which started from the sap in the main roots and stems. Cut back the trees, and those not too badly injured will start again later,

if the tree is able to re-establish its connection with soil-moisture by the growth of new root-hairs. The prevention for such a condition is under-drainage so that there shall be no water standing in the soil. The two-year-old trees were not hit before because there was not rainfall enough to fill the soil with standing water.

### Root-Action After Transplanting.

*A neighbor, while I was planting some peach trees, said I was not pruning the roots sufficiently. He took a tree and pruned off all the roots and rootlets except three or four of the largest ones, and these he cut back. He said the rootlets would not survive the transplanting, and only served to keep the earth from being packed well about the main roots. Was he right?*

The finer roots and rootlets, like threads and strings, are often worthless, as your neighbor says. They might better be cleared away, but, because of the work required, they are usually allowed to remain. Roots one-eighth of an inch in thickness there is no object in removing, if the planting and earth-pressing about them is being carefully done. Your neighbor is a little too radical, but trees will grow his way if moisture is ample. In our climate and in our soil which favor surface drying more than the humid climate, where this root-docking originated, it is better to retain longer roots in transplanting—merely making a new cut at the ends of them as they come from the nursery. This applies to what may be called average moisture conditions at planting. If the conditions of heat and moisture are ideal, and if the rootlets have not dried during transportation, they do not die but may be first to start growth. We once took up a June-bud peach, planted a month before, and found that the first new rootlets were starting from the string-like roots and nothing had put out from the larger ones.

### Treatment of Trees After Submergence.

*A prune orchard on peach root was covered with seepage water some three months and now some* 500 *trees are dead, and the remainder look very badly. What can I do for the remaining trees, what killed the ones that died, and would they have died had they been on myrobalan root?*

The trees were killed by water standing in the soil. The peach is quite subject to such injury. The myrobalan root resists it—although we do not know exactly how much submergence it will endure. There is no treatment for trees suffering from standing water except cutting back the top to reduce the evaporation and thus enable the injured roots to re-establish themselves, if their injury has not gone too far. Prevention of injury can be secured by under-drainage of such lands.

### Disinfecting Tree Holes.

*I have blown out about* 40 *stunted Bartlett pears as the roots and stumps were badly decayed. I desire to replant with Gravenstein apples.*

*Can I disinfect the holes without transporting too much water (as copper sulphate solution)? The bottoms of the holes are filled with manure, and as soon as ground settles will fill with new soil.*

Probably a good whitening of the hole with air-slaked lime, before putting in the new soil, will do as much good as anything. We should count most upon the use of good soil from a distance. Put a good deal of soil between the roots and the manure. We would prefer to put the manure on top after planting. If your blasting shattered the old subsoil so as to furnish better under-drainage the apples may come through all right. Otherwise they will follow the pears probably, after awhile. Rotten root is usually the result of planting in a place naturally defective.

### Replanting After Crown Gall.

*I have an old peach orchard full of crown gall or black knot. Would it be safe to plant to new orchard without disinfection and is any particular variety of fruit trees immune from this disease?*

Work the land deeply, getting out and removing all root-fragments and replant on lines between the old rows with trees free from knots and sign of their removal and watch the crowns and main roots by uncovering once a year the base of the trees—cleanly cutting away and Bordeauxing the wound, if any knots are found. Peach and almond roots are most subject; cherries, apricots and plums next; pears and apples least—according to our observation.

### Replanting Apples and Pears.

*I have taken out an old orchard, and desire to set it out again. Would it be advisable to set pears and apples again in the same soil?*

It is practicable providing the soil is good and suited to apples and pears as shown by the trees you removed. It would be better to manure well and run the land in alfalfa, beans or peas for two or three years or even to some other cultivated crop with deep plowing but it is not necessary to do so. Get out all the old roots you can and plant the new rows midway between the old rows, if the old distances were right.

### Manure and Tree Planting.

*Which is the best way to use manure in setting out trees: to dig the holes about three feet and then fill about ten inches of manure and about one foot of dirt? Or just dig the holes as you want them and then mix the dirt and manure well together and fill the hole with it?*

As a rule it is not a good thing to put manure in the hole with the tree—either below it or mixed with the earth in filling. Of course, if the manure is thoroughly decomposed, it may be put below as you suggest and covered with dirt, but unless you are irrigating there will be danger of the soil becoming too dry. If the manure is not decom-

posed, it will ferment and heat as well as dry the tree roots dangerously. Besides, it costs altogether too much to dig such holes. As for mixing the manure with the soil in filling around the roots, the same dangers are likely to be encountered, and besides, too much manure may come into direct contact with the roots. Plant the tree in clean soil and spread the manure on top after filling the hole. The rains will leach the richness and distribute it through the soil, and the balance can be worked in with the spring cultivation or left around the tree to reduce evaporation of moisture.

### Transplanting Date Palms.

*Can date palms be successfully transplanted? I have been told by nurserymen that they will not live unless they are transplanted without disturbing the roots.*

Palm roots should not be cleared of the soil enclosing them, but they are really very easy to move, because they have rope-like roots which hold a ball of earth together. It is not likely to break and fall apart as in the case of moving other trees. Trench around the plant with a sharp spade so that the inside of the trench shall be a foot or more (according to size of plant) from the base of the palm. Go down a foot or two feet (according to size of plant, again) and then cut under with the spade, until the plant stands in a loose ball of earth. Lift out, with tackle if necessary; settle the earth in the new place with water and keep moist. Remove a good part of the leaves before moving.

### Advantages of Planting in Squares.

*Is there any objection to using the hexagonal system instead of the square system on rolling land, and would not the hexagonal system give greater yields from this acreage than if planted any other way?*

We would prefer laying out in squares, especially on uneven ground, because it gives wider areas for working, although it does not favor working in so many directions. We have never seen demonstration that the few more trees in the hexagonal planting made the acre yield greater. The theoretical advantage of actually equal division of land and the consequent setting of a few more trees, is either not realized or is counter-balanced by the greater inconvenience in working. As for the trees getting the use of all the land we have no doubt they do that, even if the roots have to go a little farther for it.

### Do Not Graft Apples on Pears.

*I have twenty acres in pears which are about 25 years old, the main trunks of the trees being in perfect condition, but the branches and limbs are bad, due to the continued cutting out of the pear blight. Can I graft apples on them?*

Apples have no durable affinity for pears and vice versa. Sometimes considerable growth is secured, but sooner or later the scions

die. Besides the pear blight attacks apples—sometimes more virulently than it does pears.

### Carrying Power of the Scion.

*I have some large nine-year-old Emperors which I am thinking of grafting over with Thompson scions. I hear that seedless varieties will not do well on roots which produce seeds.*

The scion does, in all save very rare cases of variation, have the power to carry over its own character and to thoroughly dominate the stock. If this were not so, all our vast nursery interests and our great commercial fruit growing enterprises would fly into confusion, and all our modern agitation for selection of buds from growths of the best types would be unwarranted. You are wrongly advised. Thompson will be Thompson, surely enough for all commercial purposes. Our seedless grapes may once in a while show seeds, but it would be easier to shoot them in with a gun than to grow them in from the root.

### Lifting Trees Planted too Deeply.

*I have trees that were planted from eight inches to a foot too deep. I would like to plant these trees right this next season. Can this be done without serious damage and if so, the best time to do it?*

You can pull the trees upward several inches when the ground is well soaked with rain—if the soil is a light loam. If, however, they have grown well since planting work the soil away from the trees this winter and let them go. If they have suffered from such deep planting and have not made much growth, replant properly with vigorous new trees.

### Fruit-Thinning and Natural Drop.

*At what stage should the peach and apricot be thinned? Is it true that if the pit has colored any, it is too late and more damage results than good? Just what is meant by the "natural drop"? Will this occur if the crop has been thinned early in the season?*

It does not matter to the tree except that it is likely to make more wood growth or to make the remaining fruits larger when its load is lessened. No damage is done by late thinning, but it may be too late to enlarge the remaining fruits much. Therefore thin just as soon as you are sure the tree will keep too many after it has thrown down what it will by the "natural drop," and that is what those words mean. This will occur more or less even if you have thinned, therefore it is usual to do thinning after it has occurred.

### Shortening Shoots to Thin Fruit.

*Do you advise in thinning peaches, removing or shortening surplus shoots during May? I have tried pruning part of the fruit off, but found*

*that it stunted the growth of the tree and worked injury to the orchard. I find, however, I can get the new growth thinned out at little expense when we are thinning the fruit.*

We would reduce surplus shoots by removing them cleanly at their starting point rather than shorten them in May, for that would induce them to send out sprays of laterals and fill the tree with brush. The same thing would follow shortening shoots which you do need to retain, above the fruit. We believe in thinning away surplus shoots by complete removal of them and hand-thinning fruit, without summer-shortening, those desirable to retain. This seems to give stronger wood for the next season's fruiting—subject to the regular winter pruning against too great branch extension.

### Cutting Back at Planting.

*Some people cut their trees after planting to 18 to 20 inches above the ground. When the tree sprouts it leaves a short dead stump in the center between limbs. Other people leave two or three short limbs about two or three inches long which does away with the dead stump between limbs, leaving them about the same height from the ground as the first method. With a dead stump between limbs would the tree be more liable to get diseased?*

When the new shoot starts below the top of the cut-back stem, the stub should be cut back to near the starting place of this top shoot, so the wound will quickly grow over. You can leave short pieces of the laterals in planting (say to the first bud) when planting conditions are good and the trees likely to make a quick start. If conditions are not so favorable it is usually better to cut back near to the stem, but not so close as to injure the dormant buds at the base of the lateral. If more than one of these dormant buds start, pinch off all but the best one. Always cut back dead stubs to live bark below so they can grow over quickly; they are likely to favor interior decay of the branch or stem.

### Advantages of Fall Pruning.

*Fruit buds on peach trees have not developed well, while wood growth is excessive where water has been supplied in any quantity. Would not a light early fall pruning be of advantage? What would be the particular precautions to take other than avoiding danger from sunburn?*

If you cut back when the tree is too dormant to break new lateral growth the energy will be expended in developing stronger buds on the wood which is retained. There are advantages in getting pruning done earlier, while the days are longer, the ground harder and weather conditions better for work, and more time left for spraying and tillage and a better chance to grow a cover crop also. The chief danger to avoid is the starting of new growth in the fall and therefore signs of coming dormancy are essential. Each tree must be pruned when it

has assumed an autumn aspect and lost its summer exuberance. If this comes too early because of drying out of the soil, sunburn must be guarded against by spraying with whitewash. But trees to be thrifty and to bear well should be prevented, by irrigation, from yellowing their leaves too soon. No pruning can compensate for such a loss as that, though by reducing evaporating surface it may keep the tree alive until the rains come.

### Skipping a Year's Pruning.

*Would harm result from not pruning my orchard for one season? They are mixed trees, most of which are three years old, and which have been regularly pruned each season. There are some one year in orchard, which were cut back closely after planting.*

You can skip a year with the older trees which have been stiffened by thrice cutting back. Next year you can cut into the older wood as seems desirable. A good many growers play the game that way. The trees only a year in the orchard should be pruned before second year's growth starts.

### Pruning Almonds.

*My almonds will be three years old next February. I have never pruned them. When is the proper time to prune, and would you advise me to prune? I believe they are too bushy.*

They probably are too thick and have a lot of branches crossing each other or lying upon each other, and thus interfering with good foliage action. Your work would be chiefly thinning out surplus branching and cutting back to upright laterals branches which are drooping too much. You can begin this as soon as the foliage yellows and keep at it for the next two months or more. (See also Part I, Vol. I.)

### Pruning Prunes.

*How would you prune a French prune tree after second summer in orchard? Would you advise topping or cutting back main branches, and how many laterals would you allow to grow on main branches, and should the laterals be pruned?*

Although there is some difference of opinion as to how a prune tree should be pruned after the third summer growth there is little difference among those who prune at all, as to the desirability of rather short cutting for the third summer's growth. Prune back to a length of one to two feet from the starting point of the second summer's growth, according to strength, situation and direction of the branch. There can be no rule of inches. It is a matter of judgment. As to number of laterals, two cut-back shoots of last summer's growth from each branch of the first summer's growth would be usually enough to fill the tree sufficiently by the end of next summer's growth.

### Fruit Splitting.

*What causes fruits to split? Is sandy soil more apt to cause splitting than heavier soil? I have a few trees, seven years old, on sandy soil, that are growing finely but the fruits split.*

The causes of splitting have not been demonstrated. It is quite widely believed to be due to irregularity in moisture—either in the air or the soil or both—producing too rapid changes in the moisture conditions in the tissues. Some fruits are more liable than others; and some varieties of the same fruit more liable than other varieties. Theoretically more rapid changes would be expected in a sandy soil.

### Slitting Bark-Bound Trees.

*I have Comnice pear trees, four years old, which are "hide bound" at the union. The trees are good and healthy so far. Do you advise splitting the bark in four or five places and rubbing soft soap over the whole surface,* i. e., *between the upper roots and where it was budded?*

We would slit but not split. Run a sharp knife up or down (not sideways) through the union, to the bark above and below it. This will allow expansion and a better joint. Soft soap may be all right but we would use whitewash.

### Crude Oil and Bark Injuries.

*Climbing cut-worms were eating our fruit buds at night, and I painted the trees below the fork with crude oil. The oil seems to have injured the trees. I have made cuts on the south side of trees and find the bark dry as if the sap had stopped running.*

Heavy oils are dangerous if applied directly to tree bark. Whether it acted through sunburning and not otherwise, you can tell by cutting into the bark on the north side of the tree. If the inner bark is healthy in the shade, the presumption is that the injury is sunburn, and it may have been done before you put the oil on, though it is quite likely that the oil by darkening the bark increased the injury. Cover the oil with a coat of whitewash and see later how badly you are hit.

### Non-Bearing Cherries.

*I have black cherry trees, eight years old, in black loam, well drained, thrifty growers, healthy looking, bloom heavy, set fruit, but when fruit reaches size of a pea, it falls off. The limbs have been thinned out, but never cut back. Why does not the fruit mature, and what would you advise?*

Cherries sometimes come to such age without holding fruit, when they are on rich land and are making too much wood-growth. Stop pruning and cultivation and see what they will do. Sometimes such behavior is due to lack of cross-pollination, but if you have other

cherries near by this is doubtful in your case. If you have no others, graft one limb of each tree to a variety which bears well in your neighborhood. If you do have other satisfactory bearers graft over all the limbs to varieties which you have proved to be worth having. Top-grafting by the common method works easily with cherries.

### Die-Back on Cherries.

*Our cherry trees have died back on the ends of the top branches. Shall we cut back now or wait until after the fruit is gathered? We do not wish to injure our crop of cherries.*

Cut back to sound wood whenever you see die-back, no matter what time of the year it is. Cutting back will not hurt fruit wood which is still healthy. But die-back usually indicates root trouble and cutting back may not stop it. Your trees probably need either irrigation or drainage, according to the soil they are growing in.

### Branch Failure of Prunes.

*Some Imperial prune trees on myrobalan root, especially toward the top, did not leaf this spring, but some small leaves are just coming now; others are still bare, and are still alive. As the orchard is rather flat, perhaps it is owing to the water lying there too long during the winter.*

The myrobalan ought to stand a good deal of standing water—still it may have had too long soaking. But there is a chance of the cause being frost after the sap began to move to the top. If good leaves are coming now, the trees will probably pull through. All wood not yet starting should be pruned back to active parts.

### Almonds on Heavy Soil.

*Our soil is a clay loam of a depth from* 18 *to* 30 *inches, with yellow clay below. In your opinion, would almond trees do well on this soil?*

On a heavy soil with a tight subsoil standing water may rot the root. On a deep heavy soil the tree may remain thrifty because the soil, though heavy, is well drained, or else the local rainfall is in such amount, or distributed in such a way, that the soil does not become water-logged. If you can winter-plow very soon after a good rain the soil is well drained. If you have to keep the teams off some time, for fear they will mire down, it will be very dangerous for the almond and many other fruits.

### Can Old Almonds Come Back?

*Can* 14*-year-old almond trees on good soil, which have not been properly pruned, cultivated or sprayed for a number of years, be brought back to profitable bearing? Last year the red spider took off all their leaves.*

Some old almonds are only firewood but a 14-year-old tree in good soil should come back with proper tillage, pruning and protection from pests. The trees should be considerably cut back, winter sprayed with lime-sulphur to clean the bark, a good watch kept for red spider next June, and the foliage kept alive all during the coming growing season with plenty of moisture and good cultivation.

### Almonds Need Drainage.

*Is it right to keep the ground soaked on young almond trees during the winter months?*

If you mean soaked so that water will fill a hole (when you dig it to try), then they should certainly not be soaked. Standing water is apt to kill young almond trees. If they are on light soil, this is not likely to occur, because the soil drains itself: but there is no gain in keeping water running through it all the time. The almond should stand in soil which is moist, but not wet.

### Young Trees in Old Orchards.

*I have apricots 15 years old, the trees 30 feet apart. The soil is river-bottom land—sandy loam; irrigation in normal years is available. The land is practically in the frostless belt, and 45 lemon trees two years old do well. Shall I plant more citrus fruit trees between the apricots to have a bearing crop when the apricot trees may cease bearing?*

If the apricot trees have grown as they do in good situations, they are almost meeting at fifteen years old, and it is not expected that the young trees of any kind could establish themselves well under their prior occupation of the sky and land. The lemon is pretty good at serving itself, and if it gets water enough can be brought along for a time by cutting back the apricots to give it light. Unless the apricots are profitable enough to keep, we should clear them out and give the land to lemons; or if they are worth keeping make the lemon plantation on other land.

### Apricots at Elevations.

*I have an apricot tree which has borne good crops every year for the last four years. My elevation is about 2,000 feet. Would you advise me to plant apricots, and, if so, what varieties?*

The behavior of your tree shows that the fruit is safe with you. Manifestly the variety which you now have is the proper one to plant and you can proceed safely by grafting or budding from this tree upon apricot or peach seedlings, whichever are available. Low winter temperatures do not injure the apricot, because the tree grows successfully even in some parts of the Eastern States. The danger lies in the spring frosts after the tree has become active. It is doubtful whether your apricot growing would be profitable in competition with the crops grown nearer to transportation on the valley and

lower foothill lands. In local demand for the fruit, however, the advantage would be with you. We would advise planting only as local sale may be profitable.

### Grape Vines from Cuttings.

*Will pieces cut off from grape vines grow if taken off in the spring and put into the ground?*

Surely: that is the way grapes are usually grown. Take a shoot which grew this year and cut up its more mature part (near to the old spur from which it grew) into pieces about eight inches long and plant them (same end up as they grew) with the bottom end about six inches under ground and one bud above the surface. Do not wait for the eastern "spring": do it in February if the ground is moist and not wet.

### Which Side Up for Vine Cuttings?

*Once I saw Italians rooting some grape cuttings and they had them all planted the top end down. They said they grew better. I found out the reason later on, and it was to get a grape with fewer seeds in it.*

Grape cuttings are sometimes put in upside down because bringing the butts near the surface causes them to callus more quickly and therefore to be more sure to grow. The formation of callus is favored by heat, which, in the open ground in winter, is near the surface, which is touched by the sun. Therefore, in California and in Italy cuttings are aften inverted and buried wholly in the ground, if it is sandy and well drained. After being callused they are planted as they grew and as they are expected to grow. The Italians were right; they do grow better by such treatment, but they usually grow well enough the other way. As for turning the cuttings upside down to cause the seed to fall out of the fruit—we have no faith in it.

### Tree Planting in Old Vineyard.

*Some growers are removing phylloxerated grape vines and putting trees in same holes; saving expense of digging holes for trees. Would it not be better to put the trees between the rows where the vines were where the ground has been cultivated, and would it not be still better to remove vines this fall, cultivate the ground thoroughly and in the spring sow to alfalfa, or bur clover, and leave for one or two years before putting out the trees?*

There is every reason to set the almond trees at points not previously occupied by the vines. There is not only a chance of reduction of fertility at that point but the soil has become hardened and has lost something also from the lack of aeration which cultivation promotes. We should plant midway between the vines in each alternate row, but far better would be complete clearing and growth of

some other crop for a year or two, especially if legumes are grown as you suggest. If not, then a crop requiring deep plowing and good summer cultivation such as peas or beans or potatoes would bring the land into better shape for tree planting.

### Uprooting Grape Vines.

*Which is the best and cheapest way to remove the vines? Do you advise blasting?*

The most rapid arrangement for pulling vines is what is called the "vine puller," made of a pair of strong wagon wheels with a long pole, four by six pine scantling 12 ft. long, with strong iron hook on one end. Allow the end with the hook to project 18 in. beyond the axle of the wheel and bolt the pole down to the axle. Hitch a short chain around the vine stump; hook into this chain by raising the long end of the pole; start the horse to pull down the pole which lifts the vine and it is dragged out as the wheels proceed. If the soil is very heavy or if there is hardpan beneath a loamy top soil, blasting is desirable.

### Bees and Grapes.

*We let an apiarian put hives of bees under some trees in the middle of our 90-acre vineyard. Our Italian workingmen say that the bees will pierce the skin of the grapes for the sugar and those grapes so injured will dry up and cause us a loss of at least 20 tons before time for harvesting the crop. Is this true?*

All careful experiments known to us have demonstrated that honey bees will not, and perhaps cannot, puncture the whole skin of a grape, but if the skin is broken, even with a pin-puncture they will help themselves to the contents, if other food is not available. The inference would be that if other insects, birds, etc., are present and puncture the skin, the bees will do the rest.

### Pruning Neglected Vines.

*I have rented for one year only a vineyard of wine grapes that was not pruned last year. Tell me how to prune them to get a crop this year. They are 9 years old and in fairly good shape.*

To get fruit this year you must save the lowest cane which grew last year; shorten that to save the two lowest buds and cut away all the two-year-old cane which grew beyond the point where it started. You can prune the vine just as you would have pruned it the year before, but if you do that you will get cane growth where it ought to be but you will get no fruit this year. You will get a great break of new canes from the old wood probably and should rub off all but the best ones for the subsequent building of the vine.

### Treating Vine Stakes.

*Do you believe that an asphaltum-crude-oil-coated-stake would be injurious to young vine roots one year old?*

No; and we are not sure how much good it will do the stake. Whatever preservative effect there may be will be increased by treating the stakes some time in advance and allowing them to dry thoroughly in the sunshine. The same process will also set free some volatile matters in the oil and remove danger of injuring the roots.

### Resistance of the Tokay.

*Are Tokay vines more resistant to phylloxera than other grape vines?*

The Tokay vine usually resists phylloxera longer than other vinifera vines. It does not have very high resistance as compared with resistant vines of the American class, but it is surely to be found surviving and bearing fruit in phylloxerated districts after other vines of its species, which are grown in this State, have succumbed to the insect.

### Fig Wasp for Bearing.

*What must be done with a Smyrna fig to make it bear? Small figs come on and before they get ripe they fall off. Some say that we will have to get a wasp to sting the figs before they will remain on and get ripe.*

A small, almost microscopic, wasp grows in wild or capri figs and in summer while the Smyrna figs are on the tree they go out of the fig they grew in and go into young Smyrnas. They do not sting them at all, they simply carry pollen into the fig and that makes the seeds mature and the figs stay on and ripen. You should get some capri figs at the right time from some Smyrna fig grower or grow some yourself. If one has only a single Smyrna tree it might be possible to graft some capri figs on the branches and the work would look after itself and space would be saved, though this is not to be advocated for orchards.

### Figs from Cuttings.

*Which is the most successful method to propagate fig trees, and the proper time to do it?*

Put in, about February, good cuttings of last year's well-matured shoots. They usually root freely.

### Summer Cover in Olive Orchard.

*Is there a leguminous crop which can be grown in summer with irrigation ordinarily given olive trees?*

The cow pea is the most available summer-growing legume. But with the irrigation "ordinarily given to olive trees" you would not get much growth of cow peas and you would spoil the olive crop—coming into the autumn with weary-looking trees and shriveled fruit, which might plump-up with the rains, but never get to be first-class.

Do not go in for summer cover crops unless you are sure you have an excess of soil moisture. Irrigate and cultivate well and give the trees all the advantage you can.

### Planting-Out Rooted Olives.

*I have about 30,000 olive tip cuttings, all rooted. Would you advise me to plant them in the nursery now? I figure they have a month or more to establish themselves in the ground before frost.*

The planting can be successfully done in the autumn providing the ground is moist enough to protect the little plants from drying up before the rains come. Such planting is safer in places where frosts are absent or very light but there would be much less risk in planting out in February or later when the ground becomes warm and permanently moist.

### Do Not Plant Olive Trees in Mud.

*Intending to transplant 3-year-old olive trees, I dug holes and found that water filled them up in about 15 minutes. Shall I bale out the water and plant with plenty of earth tamped in around the tree, or had I better find out in summer time how far back from the adjacent ditch the moisture will soak through the ground, which consists of sand, loam and gravel?*

You should not transplant olives until everything begins to warm up and the buds look like starting a new growth. This may be in April or even in May. By that time you can see if there is still too much water, etc. A short stand of water in such soil will not hurt an olive, but if there is always as much water there, it is no place for an olive or any other fruit tree.

### What Is Citron?

*Where can I get seeds of the plant producing the candied citron which they sell in stores? Is it a fruit tree or a vine?*

The true citron of commerce grows upon an evergreen fruit tree just as an orange does, and budded trees can be had from the nurseries. There is a member of the melon family called the pie melon, which is also called "citron" in parts of the world where citrus fruits cannot grow, because the rind of it is preserved so that it has some distant resemblance to the true candied rind of the citron fruit. It has no commercial importance. (Curing of true citron is described in Part I, Vol. 1 of this issue.)

### Causes of Coarse Oranges.

*Why are oranges rough, with thick rind at the upper or stem end? Is there any danger of applying too much manure to orange and lemon trees?*

Oranges may become too coarse when growing on brash suckerwood or they sometimes come that way on young trees which naturally have great vegetative energy; or they may be forced into such excess growth by too free use of stable manure or other nitrogenous manures; or the bud taken to make the tree from may have bad ancestry. There is, therefore, danger in using too much stable or other nitrogenous manure. If it has already been done, use a fertilizer of potash and phosphate alone, or use none and wait for the growth to calm down.

### When to Pick Oranges and Lemons.

*When is the best time to pick oranges and lemons? Is it best to leave them on the trees to get as ripe as possible (just so they do not freeze), or should they be picked and stored away to ripen?*

Oranges should be picked whenever the price is good, after they get the proper relation of sugar and acid in the juice. This is now being determined by experts for the packing houses or by the growers themselves, before shipping. Oranges are handled fresh from the trees, and do not improve by storage though they may be held a limited time without cold storage in a place which is cool and not too dry. Lemons can be picked when of satisfactory size without reference to ripeness and allowed to get toughness and silkiness of skin before shipping or selling.

### Tubbing Orange Trees.

*Could I take up orange trees, one year old from bud, this fall, put in tubs and set in greenhouse? I am afraid of frost.*

You surely can. Let the new growth on the bud stop and harden somewhat; take up with a ball of earth on the roots and fill around the ball in the tub with good, friable loam. Have ample drainage hole in the tub bottom and then do not over-irrigate until new growth is starting, when water may be more freely used. Presumably you intend to grow the trees henceforward in the tubs; if not, we would burlap them as they stand and transplant to orchard next spring when the ground has become well warmed.

### Hardy Orange for Blossoms.

*I wish to get orange blossoms in a place where citrus fruits are not grown. How shall I try?*

The most ornamental orange in foliage, bloom and fruit is the Seville or bitter orange. It is what is called the "sour stock" in our citrus propagation and it is quite hardy. The fruit is inedible except in marmalade.

### Grafting Lemon on Orange.

*Can one graft lemon onto orange? If so, when should it be done; are there any particular ways of doing it?*

Most of our lemon trees are on orange roots—such trees being made by shield budding in the nursery. Top grafting of older trees is done with the ordinary cleft graft method but better waxing is essential, as evergreen trees do not start scions as briskly as deciduous trees. Grafting is done later in the spring when the tree shows signs of starting a new growth, which requires a higher heat in citrus than deciduous trees.

### Growing Orange Trees.

*We want to plant some orange seeds in boxes in a lath house. Will they do to bud this summer, and what time if planted in February? What fertilizer would be good to force them along? Would the bud make any growth this year? Will they do better in a lath house or in open ground?*

Although it is possible to grow orange seedlings in boxes in a lath house, it is more common to broadcast the seed in the ground under the lath covering rather than in boxes. When the seedlings are about a foot high they are transplanted to nursery rows and when about a third of an inch in diameter they are budded. This may be done from spring to fall—when in the fall the buds stay dormant until spring heat starts them out. The seedlings range from one to two years old at the time the bud starts growth, and at least one year's growth is allowed on the bud before planting in permanent place.

### Oranges in Cold Soil.

*Some of my orange trees are on lower ground than others. They seem to bloom a couple of weeks later. What can be done to make them bloom earlier?*

Underdrain the land or move the trees to higher ground.

### Winter Pears.

*What is the best variety of winter pear for market use?*

Winter pears chiefly grown in California are Winter Nelis, Easter Beurre and P. Barry.

### Seedling Japanese Persimmons.

*Can you grow edible fruit from the seed of Japanese persimmons?*

Yes: but it will generally be inferior to the fruit from which the seed is taken; therefore, to secure particularly desirable varieties, the plants must be grafted just as other fruits are.

### Replanting Peach Orchard.

*Can I plant young almond trees between the rows and let the peach trees grow for two years and then root them out? I can water the young trees in the rows if needed.*

Plant good yearling almond trees between the rows, cutting back the peaches to give the almonds plenty of light and getting a couple of good crops of large peaches on the cut-back trees. Then use water enough to keep both lines growing well. In planting, furrow out well and run a subsoiler along the line of the new rows so as to plant in root-free ground, otherwise the young trees will be hard to start.

### Apricot on Peach Roots.

*Can an apricot be grafted to a peach? Will it make a good union and fruit well?*

It surely can be: on a good peach soil there is probably no better root for the apricot. We have seen such trees over 40 years old still in good condition. This refers to trees worked over young. If you refer to grafting over old peach trees that is a more difficult matter, for old peach bark is contrary and extra care is required in grafting.

### Almond on Peach.

*Can almonds be grafted on peach trees ten years old, in good shape, roots and trunks all right, with success so they will stick, grow and produce crops later?*

Cut off the main branches above the forks and put in side-grafts without splitting the limb-ends, waxing extra well, for the peach bark shrinks and dies back badly if not covered. If you do this, let good shoots grow from all stubs on which the grafts do not take and bud into them near their bases in June. The objection is that amputations do not easily bark over and unless you watch and keep the ends painted the old wood will begin to decay and you may have a sad lot of rotten trunks below the thrifty almond branches, and this does not make for longevity.

### Moving Yearling Peach Trees.

*Should I transplant peach trees next spring that were planted last spring, or should I get new ones?*

Cut off about two-thirds of the tops and move them this winter. They will endure the transplanting all right. But if they have been stunted by dryness or disease or injury, new trees would be more profitable.

### Thinning Peach Growth in Summer.

*If five-year-old peach trees make a dense growth of wood would it be advisable to thin this growth to keep it from smothering the fruit buds for the following year?*

It is sometimes desirable to thin as you propose, not because it smothers fruit buds, but because it may make interior shoots stronger and more likely to bear good fruit. It should be done as soon as you

decide the growth is becoming too dense. Such summer pruning is seldom necessary or desirable on trees which have been properly winter-pruned.

### Pear on Quince.

*It seems to me that pear, top-worked upon old quince stumps, does not make a very dependable union, and may break down in a few years. If I put these pears upon quince root by budding in nursery, will they bear early and abundantly?*

You will get the same results and a stronger union by working on a younger stock. Put in cuttings when the new growth of the quince becomes dormant. Make them about ten inches long and put three-quarters of their length in the ground. Allow one shoot to grow from each cutting, and if it gets large enough, put in a pear bud next August to remain dormant until the following spring. If the growth is too thin to put in a bud in the fall, allow it to grow all the season and graft the following February in the nursery row. Get one summer's growth on the bud or graft and transplant. (See also Vol. I, Part I.)

### Grafting Over Young Prune Trees.

*I have several prune trees from which I wish to propagate about 200 young trees. I desire to get bearing trees in the quickest and most satisfactory way.*

Buy either myrobalan seedlings or budded French prune trees on myrobalan—whichever you can get most handily from the nursery. Plant these in orchard form. Select small but thrifty trees and when the swelling buds indicate the beginning of activity, whip or tongue graft them about 18 inches from the ground, with scions from the trees you wish to reproduce. Wrap the whip grafts with a waxed band and whitewash over all, from below the ground to the top of the scion, and look out for suckers which may take too much sap. Those grafts which grow will make you the trees you desire. Grow shoots from all stumps on which the grafts fail, and bud them soon as you can get plump buds to work with, which will be in June, and when the buds have taken, reduce the growth above them to start growth. In this way you ought to get a full stand of the kind you want (on all transplants which start at all) the first summer in the orchard.

### Quince Growing.

*I have land that seems especially adapted to growing quinces. Trees began bearing at three years and in the fourth year were heavily laden with fine large quinces. I would plant largely to these trees if I were sure of a market.*

The demand for quinces is limited and largely local. Thirty years ago there was an idea that many more could be grown for Eastern sale, but experience showed that only small shipments can be made to the East. Although the California quince is larger and

handsomer than the Eastern, they do not care to pay more for a fruit which loses its form in preparation for use. Such quinces as are now grown pay about as well as apples, but if we should largely increase the product no use could be found for it.

### Replacing Old Fruit Trees.

*Is it good policy to replant prunes in an old prune orchard which is dying out? The soil is sandy loam. Could apricots be planted on this same land?*

Why are the old trees dying? Trees in good soil and well taken care of do not die of old age in this State. If you propose to change conditions in some way so that the cause of the death of the old trees will be ruled out, you can replant the ground with the same fruit, if you wish. There is no advantage demonstrated yet of rotation of fruits. Their requirements are too much alike to allow the soil to get advantage from a change. On sandy loam, if deep and well-drained, your prunes ought to be on peach or almond root, probably. Apricots will thrive on the same soil, if on peach, or their own seedling roots.

### Budding and Grafting Plums.

*I have Bartlett plums which I wish to work over to Climax, Wickson or Tragedy. Would you advise budding now, or wait till spring to graft, or pull them out?*

We would get in buds in properly situated new shoots this summer, arranging for the right number of new branches. Where buds do not take you can put in grafts next spring and thus get a full stand. We would not sacrifice stems and roots by pulling out.

### Bearing of Blackberries.

*Do blackberries bear on new wood only?*

Of those commercially grown, all but Himalaya bear on wood which grew the previous summer. The Himalaya bears for years on laterals sent out from wood more than a year old.

### An Amateur's Strawberry Bed.

*I am anxious to have an ideal strawberry patch. The soil is light. How shall I have the ground prepared to get the best results? I am willing to do whatever is necessary to obtain an abundance of early, midseason and late berries.*

Spread a good amount of stable manure and dig in the full depth of the spade or fork. As the soil is light, enclose the patch with a levee to be six or eight inches high when the ground settles, and irrigate by flooding the check to get even distribution. Keep the surface cleanly hoed this summer to kill weeds and retain moisture. Work up well after the rains and plant Longworth Prolific, Dollar, Jessie,

Melinda, and Brandywine—if you wish quite a variety to draw from. The length of your bearing season will depend upon how well you use water. A "complete fertilizer" such as is sold for fruit purposes, is right for strawberries. Be careful not to fertilize too heavily or you will get mostly leaves, an enormous growth of runners and little disposition to fruit.

### Garden Strawberries.

*My strawberries are growing vigorously and are beginning to blossom. Shall I let them bear this year? How many runners shall I allow them to grow this fall? Or shall I pinch off all blooms and runners until next year?*

As an amateur, likely to give the plants good growing conditions all summer, you can let the plants fruit without injuring them, and you can grow them as singles for several fruiting seasons unless you wish some more plants for your own use. If so, limit the runners to meet your needs and husband the fruit capacity of the parent plants thereby. Fruiting singles instead of making matted rows is also a commercial method if one is willing to give the plants the attention required.

### Walnuts in the San Joaquin.

*On flat valley land in the Fresno region will walnuts stand the temperature and the tree make a good growth? If so, what varieties are best? Would hardpan land do, provided the hardpan was blasted through? There are no commercial plantings, but a few isolated trees are thrifty, and yield good nuts.*

On soils sufficiently deep and free from alkali, the walnut is satisfactory in your valley, if it is grown upon the California black walnut root. The Franquette and Mayette seem to be least liable to sunburn. If the land has a thin layer of hardpan which can be disposed of by digging through or blasting, with a subsoil free from alkali, it is probably suitable for walnut growing.

### Walnut Scions.

*Should walnut scions be cut a few weeks before using them? How should they be kept during this time? Does the bleeding of the stumps affect the growth of the grafts?*

Walnut scions should be cut and stored in a cold place if there is danger of becoming too active. The stock should be a little more advanced than the scion. In grafting large trees, sometimes bleeding "drowns" the scion. It can be checked by boring a quarter-inch hole into the stump near the ground.

### Grafting Walnuts.

*When is the best time to topgraft walnuts?*

Walnuts should be grafted rather late in the winter in order to avoid drying out of the scion before it starts to grow. Some success-

ful grafters think walnut grafting should not be done until within a month before the spring sap flow loosens the bark. February and March are good months. There should not be enough sap so that the bark loosens when the scion is driven in unless one is "grafting in the bark" without splitting the stock.

### Protecting Walnut Grafts.

*I have lost many of my walnut grafts by frost when the shoots for the scions were out about four inches. Could I slip large paper bags over the scion and tie same to the stump below cleft without having to remove the bags on warm days? This latter method might also protect the wax from wind and sun.*

Edwin Gower commends hooding the stump with burlap, tying it around the stump and punching holes above for the new shoots to grow through. A white paper bag could be used for a time without injuring growth unless the wind should blow the outfit over and break the tender shoots. Such bags would offer considerable resistance to the wind.

### Pith-Rot in Walnuts.

*Some of my walnut trees planted last year, and now four to six feet high, have the stem hollow. I took it first for the work of borers, but on cutting some of the trees down two or even three feet to the "green" heart have found no borer or other insect at either end. Now even two or three feet above the point where the apparently dead center stops there are green shoots. Am I doing right in cutting the stem back to the "green" heart, even where good healthy shoots are growing above it?*

The pith exposed by cutting back at planting should have been immediately covered with grafting wax, asphaltum or simple lead and oil paint. This would have excluded water and prevented pith rot. You can close up the hole now, keep the shoots which are coming on the hollow stem and trust the injury to grow over this summer, or cut back now below the extension of the rot and and cover the wound at once. Choice of method depends upon whether there are good strong shoots below to make a well-shaped tree. We would rather take the chance of the healing over than to cut to dormant buds which might make your branching-head too low. Decay from the pith is not likely to invade adjacent active tissue on small shoots if they grow actively. The enlargement of the branch, by laying on of tissue on the outside will make a strong branch in which the early decay of which you speak will merely appear as a central black line, if you cut if off a few years hence to look at it.

### Walnut Bleaching.

*I wish to know how to bleach about 200 pounds of walnuts. The electrical process is out of my reach.*

The amount of walnuts is too small to warrant fitting up any bleaching process. If you have a sulphur box such as is used in fruit drying, you can brighten the nuts by sulphuring. Let them get thoroughly dry after gathering, then moisten the surface of the shell by very light spraying, using a spraying nozzle and not a sprinkler. When thus slightly moistened on the exterior of the shell, they are treated to sulphur fumes in the same way that cut fruit is before drying. Sulphur carefully, for an overdose is not desirable.

### Polishing Pecans.

*Please inform me how to polish pecans.*

Pecans are polished by putting them in a revolving barrel only partly filled, so that as the barrel turns they fall upon and rub each other, producing a beautifully smooth surface. When it is desired to give an artificial color, a little "Spanish brown" dry paint is put into the barrel. If the natural coloring is desirable, a little sharp sand put into the barrel assists in the scouring and produces the desirable uniformity of color. This barrel is rigged up like a revolving churn, with a side door in the staves and a gudgeon on each head which is fitted into proper bearings on two posts; proper arrangement being made for a pulley or crank by which the apparatus is turned either by hand or motor power.

### Making Cider, Wine and Brandies.

*Would it be profitable to make cider and wine and to distill all kinds of fruit brandies? What regulations have to be complied with?*

The establishment of a distillery for all kinds of fruit brandies would require so much capital and would have to be so carefully located in order to be sure of a supply of fruits that the undertaking would be hazardous. Cider and wine, which do not require distillation, can be made without reference to the revenue department, but whenever you distill anything, you must make registration. You can get information about the manufacture of denatured alcohol from various waste products by writing to the Division of Chemistry, U. S. Department of Agriculture, Washington, D. C. It is very hard, to say the least of it, to make it cheaply enough to be profitable.

### Fruit Blossom Honey.

*Do almond blossoms make bitter honey?*

Honey more or less bitter, though not always objectionable to all tastes, is made from deciduous fruit blossoms. Citrus fruit blossoms yield a fine grade of honey.

### Planting Willow Posts for Growth.

*What is the best time of the year to plant willow posts to have them grow?*

Towards the end of the dormant period as the ground is becoming warm and still has plenty of moisture.

### Starting Acacia Seed.

*What is the proper time and manner of planting the seed, and the care and cultivation of the plants during the growing season?*

Acacia seed has a hard shell and the germ has to be helped out. During the rainy season, pour actually boiling water on the seed and let it stand till cool. Then sow in sandy loam in seed boxes or in the open ground, partly shaded from too much sun at first by a brush or lath cover. Cover the seed lightly and keep the soil moist, but not wet. Keep the surface mellow after the seedlings appear and irrigate during the first summer.

### Maple Trees from Cuttings.

*Can I start trees from maple branches planted in a wet sandy place as one does willows or poplar trees?*

Yes; many maple species start readily from cuttings—not so responsively usually as willows and poplars, but quite well. Take well-matured wood of the previous year's growth and put them in such a place as you describe toward the end of winter when the ground has lost its danger of standing water and begun to warm up a little. The cuttings should be dormant. But maples grow so readily and quickly from seed, that the cutting method is not much used. We would prefer to sow in the fall such fresh, well-ripened seed as we could gather than to depend on cuttings.

# PART II. VEGETABLE GROWING

### Fall and Winter Vegetables.

*It is August and what green food, good for pullets, and what vegetables, good for ourselves, can be planted at this time of the year on a southeast slope in Alameda County at late as this?*

It is not late in the season; it is early. The gardening year in California breaks into the calendar on July 1st; so you are just a little ahead of the autumnal spring time which is ushered in by the early rains, usually in September or October. You can grow by starting now with irrigation or as soon as the ground is in good condition by rainfall, all vegetables except those which are strictly tender, like tomatoes, peppers, squashes, corn, beans, etc. Even those which are counted "half hardy" in Eastern catalogues are usually safe, but must be kept going along well by good cultivation during the intervals between early rains.

Good things to grow in quantity for fowls are beets, cabbages, peas. Vetches and early sown grains are often very useful. Alfalfa can also be successfully started where frosts are absent during the autumn months.

### Sunshine and Moonshine in the Garden.

*I intended planting some tomato, pepper and cucumber plants along the north side of the house, where they will not get any sun until about 10 a. m., but my neighbor tells me that they will not amount to anything without the morning sun. Is he right? What do you think about planting corn, potatoes and other garden truck "when the moon is right"?*

There is only a sentimental difference between morning sunshine and any other kind, and we have no reason to think that the vegetable is affected thereby, as mankind sometimes is. Morning sunshine is, however, a mild article and shade-loving plants tolerate, and perhaps enjoy it, while midday and afternoon sunshine might be too fierce for them. But the plants you ask about are sun-loving, and they will be quite satisfied with the stronger kind, of which they will get enough from the middle of the morning until sunset. We invariably plant seeds "when the moon is right"—but then the moon is always right when the earth and the sun are.

### Vegetables After Alfalfa.

*I have three acres of alfalfa that I would like to put into garden truck. How and when, would you prepare the soil?*

Plow the stuff under deeply as soon as the land is moist enough in the fall and disk harrow it. Cut out any alfalfa that tries to grow—

using a hoe or a disk, according to the amount that starts from roots not well covered. If this is done in September, with early rain or irrigation, let it lie about a month and plant all vegetables not injured by frost. If there is but little alfalfa you can plant immediately after plowing under.

### Garbanzos After Barley.

*I have some barley on dobe loam, which I hope to cut for hay in June. Then I want to raise garbanzo beans.*

Garbanzos are nearer to peas than to beans. Their English name is chick-pea. You could probably get a crop by sowing in June if the land was irrigated after haying and worked well for the garbanzo planting. We doubt if you could get any kind of a start on dry plowed hay stubble, although the garbanzo will stand more dry heat after starting than any other member of the pea family we know of.

### Rotating Beans and Grain.

*Is it practicable to use beans for crop rotation on grain land in the San Joaquin Valley; planting the beans in spring, raising a crop from them, if possible, plowing the vines under in the fall and subsequently seeding the same to grain?*

It is a good proposition theoretically and good practically, if you can get the bean crop. On the plains the pink bean stands the heat better than others and is often very satisfactory. On low, moist land the black-eye bean (cow pea) gives good results. Beans generally dislike the dry heat of the plains, but there are places which suit them well. Most valley beans are grown on riverside lands.

### Black-eye and Tepary Beans.

*If black-eye beans are planted the first of April will they be off about the middle of June without water? Is there any demand and where and what time of the year? Would the Tepary bean be more profitable?*

Beans are not as lively as that. If you could plant as early as April without danger of frost (and we are not at all sure about that), you might get dry beans in July; or, if the land is pretty dry, you will get dry vines without beans before that. Black-eye beans are of the cow-pea class, and they like to grow for a long season in soil that has enough moisture. Tepary beans will be more likely to succeed in dry soil. They are very small, new and fashionable, and the seed may be in good demand for planting. They are not yet staple enough to predict prices very confidently. Black-eye beans are salable as soon as harvested to any dealer.

### Beans and Onions.

*I have excellent sandy soil on which I should like to plant onion seed for a mature crop of onions the first year. The land has been in*

*pasture for some twenty years. It was plowed last spring, and on one end of it several rows of beans were planted, under irrigation. The beans grew finely, and there also appeared an enormous growth of erodium.*

It will bother you a good deal to find the onions grown from seed in land which grows such a lot of filaree (erodium). It would be easier to kill down a lot of it by plowing and disking until April, and then set the field with transplanted seedling onions from a seed bed which you can start in February, according to the conditions of soil and weather. We would prefer to put the whole piece in beans the first year and keep cultivating to clean the land for a try at onions next year. Beans will largely kill the weeds in their rows, which onions will not do, and therefore require a lot of hand work in the rows, which is very expensive. If you conclude to try beans you can wait until March to plow under the growth of erodium. After that disk the land to kill more weeds and keep a good surface in preparation for the bean planting, which must wait until after danger of frost is over, early in May. Then keep down the summer growth of weeds by frequent cultivation. Land which gives such a free growth of erodium will bring plenty of beans without fertilizing.

### Summer-Planted Beets.

*Can I plant beets for stock food in August and make a success of them if I irrigate before planting, and when could I expect to commence to feed them?*

There is more risk in getting a good stand of beets in August than earlier or later, because of the danger of high, dry heat. The beet is more tender at germination than at other times. But if you wet down well and plant a little deeper (if your soil is light and friable) than you would in winter you ought to do well, if you get good strong seed. Afterward, irrigate as may be required to keep the beet growing. Do not wait for rain until the growth stops and then start it again with water. You ought to have well grown beets for feeding in January.

### Growing Stock Beets.

*How early and deep would you plant beets on fairly heavy, subirrigated soil—with no prospect of any surface water? And what variety is best to be fed to milch cows? When could it be expected they would be ready to feed if planted March 10? At harvest time, could I plow them out readily?*

It will take from four to six months to get a good large stock beet —according to the amount of moist heat they have to grow with. On moist land you can plant all the year, as the plant is little affected by frost, but beet seed is rather apt to rot unless there is heat enough to start it quickly. Plant thinly in drills about 2½ feet apart for horse cultivation—using about five pounds of good seed to the acre. Take the Long Red Mangel or the Yellow Tankards; they get great size and

make much of their growth above ground so you can easily harvest them for stock. Sugar or other small beets cost too much to handle for stock.

### Transplanted Beets and Onions.

*Would it be advisable to transplant in September after sweet potatoes had been dug from a sandy, decomposed-granite soil? I have trouble getting them up in hot weather. And would September be too late to set onions to use dry?*

All kinds of beets are transplanted readily during the rainy season, by growing the seedings in light soil, from which they could be easily lifted without much loss of roots. If they are then planted with a dibble, or otherwise, so the long thread-like roots will hang deep in the moist soil, they catch on very easily. This can be done on the Coast in September if rains are early or if the soil is well wet down by irrigation. In the interior it will depend upon how fierce the September heat and drouth are. If you start the seeds with partial shade and then harden them to the sun and moisten the land well after the potatoes are dug you ought to get a better stand by transplanting than from the seed at that season. You can turn about the same trick with onions and in about the same way; that is, by transplanting seedlings started in August in a partially shaded seed bed. You ought to get a mature early onion, like the Red Wethersfield, if you can keep the soil moist enough to grow the plant and then dry enough to mature it. You need to learn whether this is possible in your locality or not by trying it.

### The Corn Ear Worm.

*I would like to know what to do for the grub that crawls in through silk of corn and bores a path on outside of cob.*

Though much effort has been put forth to save the corn from the "ear worm," no satisfactory prescription was announced. If the corn is silking when the moths are flying the ears will be more or less affected. Corn planted very early or late, which does not come into condition while the moth is active is likely to have little trouble. But in 1915 two treatments were confidently announced. M. L. Germain of Los Angeles secured 90 per cent of sound ears by powdering them with arsenate of lead powder just when tasseling out. Samuel Haigh of San Jose saved all but one ear on a full row by spraying, as soon as the silk appeared, with one tablespoonful of creolin to one gallon of water. The adjacent row, not sprayed, was all wormy.

### Onion Growing.

*Is it desirable to soak onion seed in water before planting? I have tried three packages so far, but they wither away and die.*

Onion seed must be fresh and good. Soaking the seed in water is desirable especially if you are sowing in a dry soil or late in the season when the soil is likely to become dry, but there is a great deal of

onion seed on the market which is not good and soaking will have little effect upon it. Your onions should grow without withering away, if you succeed in getting a start with the plant. Dying is generally due to lack of moisture in a light sandy soil, or sometimes too much water if the soil is inclined to be heavy and sticky.

### Transplanting Onions.

*Following instructions given in "California Vegetables," I sowed onion seed thickly in a bed about the first of September, to transplant them in February. However, the plants are already the required six or eight inches in height and are beginning to be badly crowded. I expect to transplant them in the Feather River bottom in a rather light, sandy soil. Will it do to transplant them now?*

Transplant whenever you get a few days of moist air—that is, not in dry wind. If your land is not subject to overflow you ought to get a good early crop, for the light soil will take care of the rain easily and the crop will stand considerable freezing weather.

### Requirements of Onion Growing.

*What variety of onion is best for commercial production in California; are onions adapted to early spring planting in an adobe soil containing some humus and a trace of sand and fitted for irrigation if necessary, and is it possible for one industrious man to care for two acres without extra help except for emergencies?*

Onions are successful on a strong, retentive loam, which is probably what you describe as "adobe with some humus and sand." Onions will grow, but they are harder to handle on a hard, cracking adobe. The onions chiefly grown are Red Wethersfield for early and Yellow Danvers for main crop. Growing the seedlings on a sandy seed bed and transplanting when three or four inches high is the best way to get a good stand and escape a lot of labor in weeding. A man can handle two acres well enough if he knows how to make his head save his back in planting and cultivation.

### Growing Garlic.

*I have thought of planting garlic on gravelly loam. When is the proper time to plant and harvest it? Should it be handled like onions?*

During the war garlic rose to 10 cents a pound wholesale in sacks. It is usually 3 to 4½ cents. Garlic is not grown from seed, for the plant seldom flowers or grows seed. It is propagated by separating the "cloves" or bulblets which compose the cluster and which are held together by the silvery skin. Tear the cluster apart and plant the parts of it separately just as you would onion sets. This can be done at any time from fall to spring in this climate, providing the soil is not cold and water soaked. Set in October in properly moist soil, it gives you

garlic for early summer; set in February to April, it gives you a late summer and early fall crop, if it is not pinched out by summer drouth for lack of cultivation or irrigation, if needed. A deep, mellow soil is best. In the garden, plant the bulblets six inches apart in rows a foot or so apart for hoeing; in the field make the rows twice as far apart to use a cultivator.

### Peanut Growing.

*Kindly advise me when to plant peanuts and how to raise then in the field.*

Plant, after frost danger is past, in rows 3 to 4 feet apart and 16 to 20 inches in the row. Cover three to four inches. Cultivate about the same as corn, not allowing any weeds to grow in them and keeping the ground loose and mellow, and when the spikes begin to form they should not be disturbed. They require a sandy soil and should not be permitted to suffer from lack of moisture, though irrigation should be practiced in a way to prevent the ground from caking around them. (See also Part II, Vol. 1.)

### Too Many Pop-Peanuts.

*I have just harvested my peanut crop and so many of the nuts have no kernels. The ground was an old chicken pen, so was well fertilized.*

The land was too heavily manured. Direct manuring for peanuts should be avoided because the plant is too actively stimulated, makes too rank growth and fails to fill the shells.

### Growing Field Peas.

*Can I grow Canada peas in the San Joaquin Valley and how?*

You can grow Canada peas as a winter crop for forage, or you can start about February and make a seed crop in the early summer. Field peas do not like dry heat and therefore should be finished off before the dry season advances too far. For forage they may be broadcast on the hard land and covered with a shallow plowing. For seed the land should be well tilled first and the seed drilled in rows about two and a half feet apart to allow cultivation until the vines reach out too far.

### Commercial Pepper Growing.

*How will growing large peppers for sale green and dried do in the Paso Robles region?*

Practically all the commercial peppers, excepting those grown everywhere in market gardens, are produced near the coast in southern California. That district has a very long frost-free season and a certain amount of moisture in the air which seems to favor this plant. It would not be wise to undertake commercial production in the Paso Robles district without having tested the behavior of the plant on a small scale.

It would be necessary to plant very much later at Paso Robles because of the spring frosts, and whether the season is long enough to get a full development of the plant and drying in the open air, as they do in Orange county, before frosts in the autumn, would be the point to be determined. Peppers are started in the seed bed and plants set out in rows far enough apart for horse cultivation, say, three or four feet, so that the ground may be kept well cultivated during the growing season. If you cultivate one way, the plants can stand two feet apart in the rows. Grown in a good locality and handled expertly, the crop is sometimes quite profitable, but the demand is limited and the Anaheim district seems to have no difficulty in fully supplying it. For these reasons also, you should proceed carefully.

### Bell Peppers in Winter.

*Will you tell me when and how to plant bell peppers for home use by the end of February and first part of April?*

Peppers will only stand light frosts and will only hold over in nearly frostless places. This they are most apt to do in what are called the frostless belts, near the coast in southern California. If you box in a few plants with boards and cloth cover you may get fruit at these dates from holdover plants, grown the previous summer, unless you are in a very frosty place.

### Aerial Potatoes.

*What causes the tubers on the potato plant instead of below the ground? This plant appeared in a small patch of potatoes and was the only one to act so. There was no sign of any tubers below the surface of the ground.*

The plant has "aerial tubers," some of them quite two inches in length. They come about in this way: normally the the potato tuber is an enlargement of an underground stem, formed by the action of the return flow of the sap of the plant. The upward flow of sap is largely through ducts in the central parts of the aerial stems. The downward flow of sap, after its elaboration by the leaf-surfaces, is through the tissue which lies just under the skin or bark of the stem and it deposits its burden in the tuber underground. When this tissue is dried or injured in some way so that the return flow of sap cannot pass along to making tubers underground it goes to work above the injuries and makes tubers in the air. The tubers are simply modified stems, either above or below ground, as conditions may determine. When tubers form above there are none below and, for the reason stated, there cannot be. Injury to the stem may be mechanical—such as a scrape with the hoe, the work of an insect or a local disease zone, perhaps. Fortunately, it is of rare occurrence.

### Potatoes After Corn.

*What is the best method to use in clearing off standing corn stover? I have thirty-five acres of it. I do not desire to pasture the land, as I*

*wish to plant an early spring crop of potatoes, and I fear the fresh manure will cause disease.*

You can probably get all the coarse stuff free by rolling and disking more cheaply than in any other way, but we would not fear for potatoes the amount of well scattered manure that you will get from feeding down. We would put on a good bunch of stock and hurry it off so as to plow under the trash as soon as possible and plow again for potato planting.

### Potatoes "Going to Tops."

*Why do some potatoes all grow to top and have a great number of diminutive potatoes that also sprout and grow more small potatoes?*

Excessive top growth of potatoes is generally due to over-stimulation of the plant during its early life. This may be due to excessive use of stable manure and sometimes to the lack of adaptation of the variety to the local conditions. Where this excessive top growth occurs small potatoes form but are not adequately enlarged by return flow from the top in process of maturing because the plant starting vigorously with too much moisture became afterwards too dry and then starting again caused the small potatoes, after becoming abnormally checked in growth, to break out with secondary tubers.

### Growing Seed Potatoes.

*How are good seed potatoes grown?*

After you get good clean seed potatoes and land free from eelworms or other potato pests, the way to grow good seed potatoes is exactly the same as growing good potatoes for eating; by good prior tillage, sufficiently deep planting, constant cultivation to retain regular moisture in the soil (and by irrigation during the normal top growth if necessary); then when tubers are well formed, stop irrigation but cultivate to prevent the soil from too sudden drying out and to keep the tuber well covered from exposure to the sun and the potato moth until it is fully matured. Select seed potatoes not alone by suitable size and form of individual tubers, but from hills which bear the greatest number of good tubers. It should be a question of hill selection as well as tuber selection when one is working on a scale which allows him to exercise this greater effort. Of course too little attention is paid to such careful selection for seed purposes. We have sometimes seen potatoes sold for seed potatoes which were not respectable pig feed.

### Blackening of Potatoes.

*I planted potatoes last year, but they were small and some of them were black in the center, though they looked all right on the outside. What is the best kind to plant?*

This may be fusarium wilt. If so, some that are less affected will show only a dark brown circle a little way from the skin when the seed

end is cut off. If this is the trouble, don't plant any potatoes close to the place you had them last year, till several seasons have starved the fungus. Early Rose and Burbanks brought from disease-free sections are the standard. If black circles on inside show in the seed potatoes, don't plant them, for they will infect the soil. Strands of the fungus close the water tubes of the plant and cause premature wilting. Never plant very small potatoes—that's what makes them "run out."

### Potato Worms.

*I send sample of potatoes grown on subirrigated land. They are good size and perfect flavor, but many have the defect of skin as shown by the sample sent. I am told by some it is due to too much moisture.*

It is not merely moisture; your potatoes were attacked in the ground by potato scab and during or after harvesting received the eggs of the tuber moth. The flat blotches are the scab, the excavations and tunneling near the surface are the work of the potato worm. Use the ground for hay or grain and put your potatoes on new ground, after soaking the seed in formalin (1 pint to 30 gallons of water) for an hour and a half, just before planting. To escape the moth, throw earth toward the row a little at the last cultivation but do not "hill up" too much. Never allow the tubers to be exposed after digging. The moth will also attack them in the sack; therefore sacks should be well covered with straw or litter or placed at once in dark storage.

### Potatoes Scabby and Hollow.

*My land is new, broke out of old stock pasture, and very rich. Some of my potatoes are scabby and others hollow-hearted.*

Treatment for scab is given in Part II, Vol. 1. Very rich soils are more addicted to the production of scabby potatoes than land not rich in humus. The cause of hollow-heart in potatoes is overrichness of the soil and the plants given too much room to develop. To prevent hollow-heart in potatoes where the soil is very rich, they should be planted closer together.

### Sweet Potatoes in Heavy Soil.

*Is it practicable to grow sweet potatoes under irrigation on heavy clay soil containing considerable lime, provided organic matter were worked in?*

You might do well enough for home use with sweet potatoes on such soil after you had lightened it up enough as you propose, but such soil is not naturally adapted to make a handsome product, as is required in commercial production.

### Gophers and Seed Potatoes.

*What is the best way to prevent gophers from attacking potatoes when planted?*

We know no way except to kill the gophers. We know of nothing which could be added to the potato which would repel the pest without destroying the seed.

### Tomatoes Dropping Blossoms.

*Can you give reason for a tomato plant dropping the fruit buds after they have blossomed out in a nice healthy flower? How can I stop it?*

See the discussion in Part II, Vol. 1. Sometimes better setting of fruit can be induced by pinching or topping off the shoots a distance above the bloom. Sometimes good results are reported by fertilizing with phosphatic and potassic manures, free from nitrogen—if the land is too rich therein. The main point, however, is to guard against too rapid growth by using very little water, or by allowing excessive moisture to escape by slacker cultivation.

### Water Cress in California.

*I have bought a little place with a number of springs on it. I recently read an article saying that water cress could be profitably raised wherever one had a spring.*

Water cress (Nasturtium officinale) grows wild in California, having been introduced at some remote period, for one is apt to find it now on the margins of slow-flowing streams and rivulets and along the outflow from springs or uplands. If your springs are running free, the chances are that you may already have it growing. It looks a little like spinach, and it has a mild peppery flavor. If you do not find it you can get seeds from the seedsmen, start the plants in the moist margin of the rivulet and after the plants are up let the water rise higher so as to flood the roots. By making new, zig-zag ditches, just a little off the level or contour line, so that water will run very slowly, you can grow any amount of cress that you can find use or sale for, and pluck it continuously from the old roots; but we would not advise you to have anything to do with it in a commercial way until you know more about it. It is used for garnishing, for salads, for boiling as greens, etc. There is little chance of selling cress except in cities, and there is small chance of profit far away from city consumers because the cress will wilt before you can deliver it.

# PART III. GRAINS AND FORAGE CROPS

### Plowing for Summer Fallow.

*I have 500 acres to summer fallow, and the land has not been farmed for five years. How deep shall I plow? Some of the land mentioned is a sandy loam and some is adobe and red land.*

As the land has been idle so long and natural processes of soil-opening in operation, it is not essential to plow as deep as though you had plowpan to break up. You need only plow deep enough to lay a good foundation for this summer's working for moisture conservation, harrowing or disking to kill weeds and breaking up clods. Six inches deep, measured on the landside, would be a good depth. In summer fallowing for moisture, it is better to plow less deep and summer-work well than to plow deep and let her go after that.

### Rotation of Crops.

*I have land that has been sown in oats for about six years. Can you please give me a good rotation of crops for this land?*

One cannot wisely prescribe a rotation simply by schedule. One has to know the land, the markets, and the amount of capital and knowledge available. The simplest and easiest rotation to make, if you have the money to stock up, would be to go to pasturage. Alternation of pasturage and cereals, half the land to each each year, is a good way to improve the land. If you are not ready to farm with stock, the next best crop after grain would be potatoes, beets, or other roots by deep tillage, if you can sell the crop to advantage. Or you could improve the land by alfalfa for hay (if you cannot feed it), or beans, if your land is fit for it. There is no great advantage in changing one grain for another. Unless you are ready for a radical change to roots or legumes you had better use fertilizers and grow more oats if they are profitable.

### Harrowing Young Grain.

*Does harrowing grain increase the yield, and how many times should it be harrowed, and what time should it be done?*

Value in harrowing grain in California depends upon whether the surface is badly crusted, because in this state the grain is growing during the rainy season and therefore gets ready to mature early. Where the winter is cold and nearly all the growth has to be made after the rain or snow stops, harrowing is more important. Still, if you get a dry spring and the surface is crusted, start your harrowing surely. Harrowing young

grain which is trying to grow in a soil crusted by rain and wind does increase the yield by promoting the thrift of the plant and by reducing surface evaporation, thus giving the plant more moisture to grow with. The advantage of harrowing is most notable on heavy soils inclined to bake and on lighter soils inclined to cement on top. It can be done to advantage when the grain is several inches high. There can be no date for doing it, but it should not be delayed long after crusting begins, and do not wait too long for rains. It is not often done more than once, but it could be repeated to advantage in many cases. If it is taken in time, only a light harrowing is required.

### Shocking Grain.

*Is it necessary, after binding grain, to turn the bundle so that the heads of the grain are up hill? Does the grain fill better if this is done?*

Grain in the head is benefited by the passing of substance from the straw to the head after cutting. Presumably it would work better if the bundles in the shock should stand as the grain grows; but that is not a demonstration of it. There are other reasons why the head should stand on the straw and not the straw on the head. One is the reduction of loss by shattering; the other is the reduced danger of loss by storm water—the latter little in the dry harvest weather of California, but the total may be about the same in favor of standing sheaves on their butts and not on their heads. On the other hand, the chief advantage of shocking, in California at least, is to get the benefit of slower curing, and the enrichment of the head at the expense of the straw, before rapid drying could stop the process.

### Oats or Barley in the San Joaquin.

*I have twenty acres of land which is checked and easily watered. This land has produced two and one-half tons of fine oat hay per acre, and it has produced over a ton of Egyptian corn per acre. I want to put it in either oats or barley, with the idea of making grain. Farmers advise me to put in oats, while the warehouse people advise barley.*

Barley is more apt to come through with a grain crop in your valley, because it is less subject to rust with spring showers. But with oats you can watch for rust and cut for hay if it threatens, or if grain prices are low. This gives you more chances with oats because barley hay is not so desirable for feeding and is much lower-priced.

### German Millet.

*Is it too late to sow German millet when you have about three months to make hay before a freeze?*

German millet, or Hungarian grass, does not like dry heat. All accounts we now have do not favor it for California interior situations, at least. If you were sure of three months' frost freedom, you could get quite a growth of sorghum, for dry forage, if thickly broadcast and

cut with a mower—but it would not take much of a frost to knock it out. Oats and rye make good hay quickly if you have moisture. You can put in rye for green feeding during the winter. It will grow with less heat than most wild forage plants.

### Wheat in Upper San Joaquin.

*What variety of wheat would you plant on heavy red soil eight feet to water? It has been sheep-pastured two years. Should it be summer fallowed? Is wheat successfully treated for smut and rust? If so, how?*

White Sonora wheat constitutes something like three-quarters of the wheat crop of your district, and has demonstrated particular adaptation to your conditions. Do not undertake treatment for rust for treatment will not effect anything if rusting conditions prevail in the spring. These are not usually to be expected in your district, therefore, Sonora, though liable to rust, is safe in your region. The seed should be dipped, to kill smut spores, in a solution of bluestone, one pound to four gallons of water. Be sure the seed is thoroughly wetted, and then dry as quickly as possible by exposure to the air. We should plow and disk the land in the winter and surface-work it later, if weeds start start during the summer. When weeds start with the early rains, kill them out once or twice to clean the land before sowing the wheat, which should be done in November or December, according as moisture conditions are right for a sure start.

### Emmer for Dry Lands.

*I sowed six acres of "Ammor" barley or Hammor barley—which name is correct? Also what is it? Nobody knows what it is. It grows finely. I sowed it in February and now it stands thirty inches high, but gives no sign of heads yet. It is soft and thin, like grass. What is it good for—for grain or for hay, and what is the grain used for?*

The grain is "Emmer"; it is not barley but a near-wheat, although it does hold the husk or chaff on the grain like barley. It comes from the north of Europe, where growing conditions are hard, and it stands both frost and drouth better than wheat or barley and it does not rust. Some dry-farmers on uplands in southern California speak well of it, and it may be more widely useful in this State because of its drouth-resistance. It makes good pasturage because the stem is soft when green, as you describe, but it makes rather poor hay because the thin stem gets very hard unless it is cut very early. It is probably poorer for hay than either wheat or barley. The grain is about as valuable for feeding as barley, and can be used in the same way. (See also Part III, Vol. 1.)

### Barley on Salt Marsh.

*Can I sow barley on marsh land which has considerable salt grass on it, and in winter it lies under the tide water for about one month?*

You can only tell by trying a little patch on it—sowing late in the spring. Usually such land has to be leveed, with gates to exclude tide water and let out rain water, which carries the salt with it.

### Hog Millet.

*What is the correct name for "hog millet"? I have heard that it is a quick grower and a heavy yielder. What is the best time of year to sow it, and how much seed to the acre. What is its value as a hog feed compared with barley? What is the best grain to plant on rather heavy unirrigated red mesa land for hog feed?*

"Hog millet" is Panicum miliaceum, sometimes called "broom-corn millet" because of its branching head. It is, of course, not broom-corn, which is a sorghum. Hog millet is not tall-growing nor so leafy as some other millets, but it makes more seed—which is larger. It is used in Dakota in place of Indian corn because it matures in a shorter season and endures heat and drouth well. It is poor as compared with barley. It must be sown after frost danger is over, at about 25 pounds to the acre. If you can grow rye or barley during the rainy season and sorghum grain (Kaffir, milo, etc.) after frost, you have nothing to gain from millets—hog or otherwise.

### Rye or Oats.

*Which of the two cereals, rye and black oats, grows best on lowland?*

Rye is naturally adapted to growth on light soils neither too moist nor rich, while oats luxuriate in a moist, rich soil and would, therefore, barring the chance of rust, be more likely to meet your requirements.

### Grains and Cheat.

*What is cheat grass in hay? I am told it comes from oat seed under certain conditions, but am inclined to doubt this. What is its feeding value compared with oats?*

About 1875 Professor Hilgard pointed out that the "cheat" found in California grain fields is a wild rye grass, while the "cheat" in Eastern grain fields is a wild brome grass. Those then who hold that grain turns to cheat have to admit that grain turns to one wild plant in California and to another wild plant in the East. The fact is that it turns to neither, but when cold wet ground causes the seed grain to rot, whatever wild plant which can endure to have its seed soaked in cold mud is likely to appear in the place of the grain. The wild rye grass which comes as cheat in California has feeding value when it is young and tender, and is considerably used for pasturage. As it matures it becomes hard and stemmy and is very much less valuable than hay made from either wheat, barley or oats.

### Sorghums and Alkali.

*Dr. Hilgard mentions sorghum as an excellent grain in reclaiming alkali lands, as it stands copious irrigation. To what sorghum does he refer? Milo maize, Egyptian corn, feterita, etc., are all recommended, "especially for use in non-irrigated sections."*

Professor Hilgard probably referred to Egyptian and Kaffir corn, for they were used chiefly at the time of his experiments. But be

sure to note that he did not commend sorghum for alkali but for its ability to make use of lots of water put on to wash out alkali. Sorghums do not like alkali, but take kindly to a place after the alkali has gone. The newer sorghums are commended for drouth, but not for drouth and alkali.

### Sorghum in Coast Valleys.

*Would Egyptian corn or sorghum do fairly well in the Pajaro Valley? It does not seem to be grown. Will it do in this coast climate?*

The sorghums are relatively less valuable in the coast valleys because the conditions which make them most valuable in the interior valleys, viz., resistance to heat and dry air, are not called into play. Probably Indian corn should be preferred with you.

### Feterita.

*What is feterita and where did it come from?*

Feterita is a sorghum. It was imported by the government from Africa in 1911. It belongs to the durra group, and is similar to milo and Kaffir, except that it has a larger grain, which is round and almost pure white, and the plant matures in less time. Like Kaffir and milo, it is drouth resistant, and held to be more resistant than either the milo, Kaffir or shallu. Its foliage is likely to hold green after Kaffir and other similar corn has been killed by frost. It does not shell off and waste while handling as badly as does Kaffir. The heads grow erect, are of good size and compact.

### Harvesting Sorghum Grain.

*Tell me how to harvest Egyptian corn. What is the best implement to cut the corn? Is there a ready market for it?*

Egyptian, Kaffir and other sorghums for grain are usually allowed to dry on the head in the field and are then cut off with pruning shears or knives, thrown into wagons, and piled in the barn or stacked beside it to be threshed when convenient. Much of it is fed without threshing. It is a standard corn on the market and has a ready sale. (See also Part III, Vol. 1.)

### Indian Corn or Sorghums.

*Would Kaffir corn do well on sandy loam, and is it more profitable than Indian corn? I have irrigation water.*

Kaffir corn and other sorghums will outdo Indian corn in most interior valley situations because they stand heat and drouth better, and both are good feeds. Both should be sown as soon as frost dangers are over—usually by May 1st—but the land should be well prepared long before that time. (See also Part III, Vol. 1.) Sorghum will usually yield in grain a little more than Indian corn under favorable conditions and a great deal more under hard conditions. With fairly good conditions you might get fifty bushels per acre. Sorghum will do more with

ten inches of rain than any grain which has to make its growth in the summer. Of course, barley or rye, growing while the rain is falling, will get a higher duty from that much water.

### The Mixing of Sorghums.

*Will Egyptian corn, dwarf milo, or Kaffir corn mix when planted in adjoining fields?*

Yes, the sorghums are greatly inclined to mix, and that is the reason why one gets so many freaky plants from common seed, which is good enough for feeding. Sorghum seed should be gathered from true plants of the type grown at a distance from plants of other types.

### Corn Stalks, Bermuda and Alfalfa.

*Would it be a good idea to plow under corn stalks in November and plant oats for hay; after the hay is cut, plow the land dry several times to kill Bermuda grass and sow in the fall to alfalfa? Would the corn stalks be worked up enough by that time so as not to interfere with a good seed bed for alfalfa?*

We suppose you refer to moist land, for on a dry land Bermuda sod you would presumably not get corn stalks enough to matter what you did with them. On dry land, too, if you did have so little Bermuda as not to check the corn, and you had plenty of stalks to plow under, whether you would get oat hay worth mentioning would depend upon whether there was a good heavy rainfall or not. With corn stalks below and dry winter skies above, you would not get much oat hay. On moist land your program might work through all right, but on ordinary plains land we would windrow and burn off the stalks and kill out as much Bermuda as possible by a good dry disking—beginning as soon as you can get clear of the stalks. Then you can put on your oats and get winter growth while it is too cold for Bermuda and go on with your dry working the second summer. But if alfalfa was the prime object we would omit the oats, put in the alfalfa in the fall or spring as early as safe. Unless the land has alkali enough to give the Bermuda the right of way, alfalfa will fight it and make good feed of the mixed growth.

### Cover Crop to Reduce Moisture.

*I am thinking of using sorghum broadcast for a cover crop in my two-year-old prune orchard on account of the rank growth it makes, but I wish to know if the decaying sorghum forms any acid injurious to the prune. Will cow peas be better than sorghum, considering fertility and humus added to the soil? I plowed under a heavy stand of bur clover this spring and have again seeded to clover, but as a summer cover crop I wish to use one of the above. I don't want to use alfalfa because with the dense foliage it holds the top soil too moist.*

As you wish to get rid of moisture a broadcast of sorghum will do that during the frost-free season better than any other plant known to

us. It will not catch any atmospheric humus. For that, cow peas would be better, but for pumping out water not so good, and for covering the surface against evaporation, cow peas would be worse than alfalfa. With such moist soil and plowing under green stuff twice a year, you are in danger of souring the soil, but you can correct that by liming. The treatment you propose ought to slow down your prune trees. Under more arid conditions it would run them out.

### Cover Crop on Summer-Crop Land.

*Will the plowing under of wild oats have a tendency to dry out the ground to be sown to Egyptian corn, milo maize, etc., about May 1? When should a heavy soil be plowed for such planting?*

If you plow under in February and you get fair rains in March, your summer crop will be advantaged, if the stuff is plowed in well and the land is straight-disked or subsurface packed after plowing, to close up air spaces below without dragging out the stuff. This will cause it to decay in a retentive soil. The same practice is the best preparation for a summer crop, even if you have not much to plow under. It is a great way to save moisture, but if you are not turning under much you can use a harrow instead of the other tools mentioned.

### Spring and Summer Feed for Hogs.

*I want to plant in Sonoma County two separate fields of green forage crop for hog pasture to cover the periods from March 15 to May 15, and from May 15 to July 15, respectively. I have pasture of bur clover and wild oats and other natural grasses on which I can carry the hogs until about March 15; and after July 15 I have oat stubble, etc.*

For your earlier period you can get good green forage from oats and vetch sown together early in February. For your later period we know of nothing to beat alfalfa. You can get good returns from unirrigated alfalfa on land which many people will tell you will not grow it. We have seen volunteer alfalfa growing rankly in fence corners in July on the farms of such people in your part of your county. Of course, if you can irrigate it you will get much more growth. Unless you are in a frosty place you can sow it as soon as your land gets wet by rains—if they are not delayed too long.

### Double-Cropping on Short Rainfall.

*I have some black-eye beans in now. I had intended after taking the beans off to plant the ground to oats, but a neighbor suggested planting field peas, raising these during the winter and cultivate and then when they were taken off to replant the black-eyes. Would this be practical on land which is not irrigated, with a rainfall of ten inches? By careful cultivation would it be possible to raise these two crops of legumes instead of one of grain and the black-eye beans in the alternate years with this amount of moisture?*

It will put your ground into better shape for the growth of a summer crop of black-eye beans if you could grow a hardy legume like field peas or vetches during the preceding winter season, but unless you have more than ten inches of water available there will not be moisture enough remaining to make a summer crop of black-eyes. It is certain that winter-growing legumes, cultivated for the retention of moisture, would leave the ground in better shape for a summer growth of black-eyes than it would be after a crop of oats had been grown, for a crop of oats or other grain would bring moisture to its minimum. But for such double-cropping as you propose irrigation is essential with such scant rainfall.

### Alfalfa on Sandy Land.

*I planted alfalfa on sandy land, but got no crop, as the land became dry quickly and so hot that the young alfalfa died out. It was planted in the springtime. Is there any way to make alfalfa grow upon sandy land?*

Alfalfa is all right on sandy land if you start early and have water ready to keep it going; for such soil requires irrigation earlier than heavy soil. You should sow alfalfa not later than February in such soil, if it is not a very frosty place. To stand the drouth and heat the plant must have time enough to root deeply.

### Harrow or Disk Alfalfa?

*Which is the best to use in stirring or loosening the ground on alfalfa, a spring-tooth harrow, or a spike-tooth disk?*

It depends upon the soil, the age of the stand and what you are doing it for. Each grower is likely to answer it according to his conditions, and therefore all types of alfalfa-agitators are well spoken of. If it is to loosen up the soil crust, the full disk set pretty straight and the spike forms of revolvers will all do it—the spikes usually giving most trouble in clogging by winding rubbish. If the alfalfa is well rooted, full disks and spring tooths do not usually injure the crowns, and are widely used. If the alfafa is to be cleaned from grass, etc., the spring-tooth works well. On the whole, there is probably no best tool for the purpose, just as there is no best plow, or incubator, or agricultural editor. Keep trying them until you get the one that suits you. (See also Part III, Vol. 1.)

### Alfalfa Leaf Spot.

*Some disease has destroyed first crop of alfalfa which promised to be good before this last rain. Both that four years old and that sown last spring appear alike. It is in Santa Cruz.*

Your alfalfa has the fungus commonly called leaf spot (Pseudopeziza). It does not usually do much harm in California, and is more destructive this year because of the extreme aerial moisture. It will be less as heat and dry air come on—unless you are in a spot where

these do not prevail. Naturally, more injury from this disease may be expected near the coast than in the interior. Cutting and burning the infested stuff will reduce the spores ready to attack later growth.

### Gypsum and Alfalfa.

*Would gypsum stimulate the growth of alfalfa on places where I did a good deal of scraping when leveling the land a year ago? Next year I probably will have stable manure, but for this season I should have something to stimulate the growth.*

Gypsum will push the growth and will help to mellow the hard places, if you are irrigating, so as to dissolve it. It is best applied before the last rains are over. But you are right in getting some stable manure as soon as you can. (See also Part IV, Vol 1.)

### Rape and Alfalfa.

*Does rape grow well in this country, which is irrigated? Is it better than alfalfa for hog pasture? Must it be planted each year, and how do the plants compare as to feeding qualities?*

The chief advantage of rape in California is that it is a winter grower and will make much green forage at temperatures which keep alfalfa dormant and will turn rainfall to account. Irrigation water is far better used in growing alfalfa because it is much richer and can be made into hay, which rape cannot. Rape is an annual. Alfalfa is perennial. For California a winter-growing legume, like vetch, is much better feeding than rape, because it is nearer to the alfalfa standard of nutritiveness.

### Russian Thistle and Alfalfa.

*Is it wise to sow alfalfa on land infested with "Russian thistle"? What is the most successful means of fighting this pest?*

There are several plants which are locally called "Russian thistle" in California, so we are not quite sure whether you have the true Russian (salsola) or not. Supposing you have the true one, the answer would be: the way to kill out the plant is to keep it from going to seed. It is an annual and therefore has no hold-over roots. It can therefore be killed out by frequent mowing or by herding sheep on it, for it is liked by stock when young. It is desirable to sprout as much of the seed as you can by early-fall heat moisture and clean the land by several diskings. Then plow deeply so as to bury more seed, work up the surface, and put on the alfalfa in February, or later, if your land is frosty. If the alfalfa gets ahead it will run out the weed all right. On blowing, sandy soil in Nevada it has proved desirable to drill the alfalfa among the young thistle, thus using the thistle as a sort of a nurse crop. The thistle shades the soil and prevents the sand from blowing; also helps hold the moisture till the alfalfa gets its right start. Then the alfalfa will crowd out the thistle.

### Restoring Alfalfa.

*I have two-year-old alfalfa that is a poor stand. Should I cultivate it and sow in or should I plow it up and reseed it?*

It depends upon how poor the stand is. If it is fairly good or good in spots, scratching-in seed may help the bare places, since the stand is so young. A poor old stand is hard to catch in with. Probably, as a rule, when one is sure the stand is poor or worse, it is better to start over. (See also Part III, Vol. 1.)

### Storing Alfalfa Hay.

*Will alfalfa hay keep in a barn loft after being in the stack long enough to sweat?*

Surely; we have seen this done in many instances in the interior valleys where stockmen ran short of hay and were compelled to buy from neighbors who had already stacked theirs.

### Alfalfa Tonics.

*My alfalfa is a good stand, but it makes a poor growth. I will disk it this fall and put on barnyard manure. I would like to use gypsum. Would you mix with manure and spread broadcast before disking? Also, how much per acre?*

Spread the manure and disk this fall after the last cutting, as you propose. The gypsum can be best applied in the spring when the growth is starting and still more rain is to come. You can use 300 lbs. per acre, broadcasting it over the surface. For a small field a fire shovel makes a good throwing implement for one hand. The first following rain will take care of it.

### Alfalfa on Heavy Land.

*I have ten acres I wish to plant sometime in March; it is all leveled and checked now, but will have to be replowed. It is only fairly well drained and water is standing some now from the heavy rains. How should I plant it—deep or shallow—and should the ground be settled, after plowing, with water to insure a firm seed bed? If I can get a good stand this spring, would it live through the coming winter rains, or would it likely drown out? I wish to plant it in March so as to catch spring rains to bring it up.*

Replow as soon as the ground is in good shape, and harrow thoroughly. Cover the seed very little. If the surface is a little cloddy, the alfalfa will come around all right if moisture is right, but there ought to be a good degree of pulverization. Do not water-settle after plowing. There is danger of making the ground too cold and wet If you can get the seed up by rainfall, irrigation will behave better after the stand protects the land. Alfalfa will stand overflows when the plant is dormant but is not likely to be long-lived if the ground stays too wet during the summer.

### Alfalfa and Weeds.

*I have alfalfa in the Feather River bottom. Last year I cut three good crops, the first being mostly weeds, but the others were good. This year the land was covered with water for several weeks and, although the alfalfa does not seem to be killed, there is a big growth of dock, and I would like to know if there is any way of killing off the dock, as I am afraid it is going to kill out the alfalfa.*

Your alfalfa will come out ahead of the weeds in the secoud cutting, as it did last year. Flooding while the plant is not growing does not hurt alfalfa. If the dock growth shades the ground too much run the mower over it and let the alfalfa come through as the stuff dries and shrivels.

### Silage Yield of Alfalfa.

*How much silage will one ton of hay fresh from the field make?*

The amount of silage one will get from a ton of green alfalfa will depend on how much the alfalfa is allowed to dry out before being placed in the silo, and on the losses through fermentations and respiration of plant cells that occur in the siloing process. In order to secure a good quality of silage the alfalfa must be run through a cutter and packed well in the silo with the least possible delay after it has been cut in the field so that there is a minimum evaporation of the water prior to the filling of the silo. After the green alfalfa is placed in the silo the losses of feed materials will depend on how well it has been packed and how air-tight the silo walls are. In silos with thin, flimsy walls a considerable loss of nutrients will occur, viz., one-fourth, or more, while under favorable conditions the loss should not exceed ten per cent. In answer to the question, we may say, therefore, that if alfalfa is promptly run through the cutter and carefully packed in a well-built silo a ton will be likely to make between 1,600 and 1,800 pounds of well-preserved silage. Since four tons of green alfalfa make about a ton of hay, four times the amount given, or between three and three and a half tons of silage will correspond to a ton of hay.—F. W. W.

### Killing Alfalfa Dodder.

*Will you inform me the best method of destroying dodder?*

Dodder is a parasitic plant which starts from a seed brought in, generally with the alfalfa seed. As soon as this little seedling starting from the ground gets high enough to grasp and entwine an alfalfa stem, it grows into this stem, sending root-like suckers into the tissue of the stem. As soon as it has done this the part near the ground dies and disappears. Dodder is an annual—that is, it has to start every year from the seeds which are freely dropped by the older plants which are attached to the alfalfa. Anything which will prevent its going to seed will kill it off in a year. The usual mowings for hay are too far apart, because the plant blooms and forms seed as it grows; and by the time the alfalfa is ready to cut some of the lower blooms may

have formed seed which will be ripe enough to germinate when dried with the hay and dropped to the ground as the hay is gathered up. Dodder can be prevented from blooming and seeding by pasturing close all summer. Another way to kill it off is by burning before the seed ripens. This is sometimes done by spreading straw and burning, but it is easier on a small patch to go over it with a plumber's gasoline torch, burning all you can see of it. If blooming is prevented the dodder will disappear. It does not spread from field to field in any mysterious way, by wind, etc. Never allow animals to pasture clean alfalfa after grazing doddered fields.

### Second Growth of Corn.

*If Indian corn is sown broadcast and cut for fodder when about two feet high, will new shoots start up from the roots, the same as Kaffir corn? I have water to irrigate.*

If the plant is still green and vigorous when two feet high there will be second growth, but not such a free second growth usually as you get from a sorghum.

### Alfalfa and Corn.

*What is the best crop sown in the fall to plow under in spring? The ground has been in alfalfa about five years and pastured most all the time, so there is no alfalfa left. I wish to try corn on it next year and seed back to alfalfa.*

You can get most winter growth with rye and pasture it down somewhat before plowing under in March. Then disk or cultivate to clear the land and hold moisture for the corn which will be planted after frost danger is over. Be sure to plow in the stuff early, for much of the success of the corn will depend upon that.

### Soy Beans.

*How shall I get a crop of Soy beans; how many pounds to the acre to plant, and when is the right time? Do hogs take to the beans readily? Will the plants when green make good green manure turned under; also what is the feed valuation of the beans?*

Plant about thirty pounds to the acre, dropping about two inches apart in drills two and a half feet apart, after frost-danger has passed, and cultivate as you would other beans. The crop should be cut before the pods fly open and cured or siloed or hogged off; for this use the crop may be dropped in the hills with corn. Hogs eat them readily though they may have to learn it, and the bean forage has the same character as alfalfa, but slightly less in degree. They are good for green manure, according to the amount of growth you get.

### No Sod on Dry Lands.

*If you have a book on reseeding worn out pasture lands for cattle, will you kindly mention it?*

There is no book on reseeding wild pasture lands in California. The growth on these pastures is chiefly annuals, because extreme summer drouth prevents the growth of perennials such as are grown in the East and in moister parts of the Coast. The chief ways of improving California dry-land pastures are to guard against overstocking; to keep the stock off when the land is too wet, and to give the native plants a chance to seed toward spring—turning in the stock again later for dry feeding which does not interfere with the natural reseeding of the land. Of course, sowing seed of winter-growing annuals like bur clover, alfilerilla and wild oats will help the natural process of multiplying the same plants, which are among the best we have for winter growth and self-seeding, but for sod-grasses, such as they have in rainy-summer regions, you cannot get them on dry lands without water.

### "Million-Dollar" Grass.

*Where can I get some of that New Zealand grass that they call the "million-dollar grass"?*

The so-called million-dollar grass was a disappointment. It is Paspalum dilatatum, which makes wonderful growth in hot, interior situations with plenty of water, but it will not grow at all during the winter and will not grow during the summer on dry land.

### Grasses for Coast Uplands.

*What amount of seed of Italian rye grass should be sown per acre on rather sandy soil? Also give a list of any other grasses you think might do well in Marin county, especially clovers.*

Italian rye grass is usually sown about fifty pounds per acre and should be started as early as possible in the fall for it is not injured by frost, and the catch will depend much upon growth early in the rainy season. No introduced clover will compare for winter growth with the common bur clover. On the moist lands of Humboldt county, white clover and alsike clover live through the summer, but that would not be possible on sandy soil without irrigation. You may improve your winter pasturage by using Italian rye grass, English rye grass, orchard grass, red top and tall oat grass. They will all try to live through the dry season by bunching and are all pretty free seeders unless too constantly fed off through the spring. The mesquite (Holcus lanatus) is a coarse grass but has sometimes been described by dairymen in your district as the best of introduced grasses which they have tried.

### Grasses for Mountain Pasture.

*I wish to sow grasses, principally for pasture on land fully four thousand feet high. Which kind of grass would be likely to meet my requirement and about how many pounds to the acre?*

You should sow a mixture and let the best take the land: orchard grass, red top, perennial rye grass, timothy and awnless

brome grass, five pounds of each per acre: and add to this one pound each of red clover, white clover and alfalfa per acre. All the grasses named will hold verdure through some frost and will hang on through much drouth, though they may bunch up to resist it. Timothy would only be included in mixtures for far north and high up; others are good for valley and coast lands which are not too dry. The clovers are worth including; they may do better in a mixture on loose soil than they would alone. All the plants will make good use of even a little irrigation water.

### The Rye Grasses in California.

*You mention Mr. Foster of Marin County as raising sheep on Italian rye grass planted twenty years ago. From reading seed catalogues I have the impression that the Italian rye is an annual. What is the Latin name of this grass? Does it make a sod? I have heard that some species of rye grass will stand a great deal of overflow, actually making growth while flooded. Is this so?*

Botanically, Italian rye grass (Lolium Italicum) and Perennial rye grass (Lolium perenne) are very near together, and some authorities have made the former a variety of the latter species. In cold countries both are rather short-lived, but perenne lasts longer than Italicum, the latter being often killed every year, and that is the reason why you see it put down as an annual in many catalogues. In milder climates, like that of England, perenne lasts notably longer, and hence its common name, English rye grass. In California valleys both species are practically perennial and as the Italian is rather more leafy it is often preferred. "Australian rye grass" is English rye grass, which came to California via Australia. All these grasses are very hardy in California coast and valley regions. They will not live through the summer on dry slopes, but will live with very little natural moisture or irrigation. They will stand submergence and will grow in the water for some time, and they will grow all winter. With moisture, rye grasses make a sod; on drier lands they protect themselves by bunching.

### Sudan Grass.

*What is your opinion of Sudan grass? Is it a good stock feed to raise? Does it have serious objectionable features?*

Sudan grass is an immense grower of coarse forage. It makes a heavy coarse straw if allowed to go to seed, after which it may be cut and another big crop of grass for grazing or hay will grow. Sudan grass is a botanical relative of Johnson grass but it has a different root-life and only lives one season, though it has lived through in strictly frostless places. It is, of course, not a winter grower and cannot be safely sown until things are right for planting corn in the locality. It is not of high feeding value, being compared with Johnson grass in that particular. It will not replace alfalfa where that plant thrives, nor can it take the place of any of our winter-growing forage plants. Its specialty is drouth-resistance during summer growth and

the production of tremendous growth where moisture is adequate during the frostless months. Its seed so closely resembles Johnson grass that there is danger, unless seed growers are very careful, there will be a mixture and Johnson grass would be introduced in the seed.

### Alfilaria or Filaree?

*Give a brief outline of the value of alfilaria in California, also its habits and soil and moisture requirements.*

Alfilaria or "filaree" (both names being corruptions or derivatives from the Spanish name of the plant, alfilerilla), is sometimes called pin-clover or pin-grass, but it is neither a clover nor a grass but a member of the geranium family. It is in California a very valuable, wild, winter-growing forage plant—generally grazed but occasionally cut for hay. It is an annual, starting with the fall rains, growing freely during the rainy period, making seed progressively while in growth, and dying with the drying of the soil early in the dry season. Its growth is directly proportional to the richness of the soil and the abundance of moisture, though it endures drouthy intervals in the rainy season well and is therefore entitled to drouth resistance, though it grows little during the California dry season except on low, moist ground. It must be sown each year either naturally or by seeding—actually it is almost entirely self-sown. It is a good wild feed during the growing season and its remains are a factor in the naturally-cured hay or what is called "dry feed" in this State. From California the plant has been distributed widely southeast through Arizona and beyond, where winter temperatures are not too low for its endurance. It is not a plant for "wintry" climates.

### Objections to Sweet Clover.

*You refer to "sweet clover" as though rather skeptical of its usefulness. Can you give me your reasons? I plan to sow white sweet clover in a small patch for soiling, with barley as a nurse crop, in land that has had corn.*

Our objections are that the yellow species grows all too well with the moisture which would make a barley or wheat crop and is counted a great pest by grain growers, not only because it takes the moisture but it imparts its perfume to the grain, and it even goes into the flour and disgusts the bakers. The sweet clovers are good winter growers in California. White sweet clover persists in making winter growth in alfalfa, and sometimes leads the farmer to think that he has discovered a new kind of winter-growing alfalfa, but he soon learns that the intrusion is exceedingly undesirable because the plant is not generally acceptable to stock, owing to its rank flavor. Another objection to sweet clover is that it is not perennial as are red clover, alfalfa, etc., and its growth the third year depends upon the seed of the second; and though it will be very likely to come, it is apt to be patchy unless the seed is gathered and

resown. As to sowing barley as a nurse crop for sweet clover, it will be the barley that will need a nurse when their fight is over.

### Starting Bermuda Grass.

*How shall I start Bermuda grass, from the seed or the slip? Is it necessary to cultivate the ground?*

It is easiest to start Bermuda with root pieces which can be scattered and harrowed in; or they may be dibbled in at intervals of a couple of feet or so. This can be done at any time when the soil is warm and moist. But be sure you wish to have Bermuda as a constant tenant before you do it. It will need no cultivation to stay in and it will defy cultivation to get it out.

### Bermuda Grass and Ground Freezing.

*Will Bermuda grass grow where there are real cold winters?*

Bermuda grass is of very little value in the United States north of Maryland. Even in places northward, where ground freezing may not be hard enough to kill the roots, it is still so late to start and so frequently cut back by frosts that it is of little account. The same rules would apply to the Pacific Coast: viz., where there is hard ground freezing or liability to frost late in the spring and early in the fall Bermuda is practically useless.

### Bermuda with Other Crops.

*Tell me a good method for eradicating Bermuda grass of long standing on moist river bottom land. Is Egyptian corn a profitable crop to sow on rich bottom lands?*

We know no way to get Bermuda out of such land, except by a long process of fallowing and weekly under-cutting to prevent the Bermuda from ever seeing the light. But you can work in other plants to fight Bermuda and make good forage or pasture with them. If the water is not too near the surface, alfalfa will fight it with chance of keeping a good hold if started in February, if the place is not too frosty, when the Bermuda is dormant. If water is too near the surface, red clover will work instead of alfalfa. Sorghums will all be glad to grow on rich bottom land of course, but on such land Indian corn would probably be more profitable. Neither would, however, do much on Bermuda sod until after the killing process. (See also Part III, Vol. I.)

### When to Inoculate Bur Clover.

*Is it profitable to inoculate bur clover seed before planting? I aim to reseed a worn out pasture that has never been plowed and has no irrigation. The land is red and bakes hard and produces nothing but a light crop of wild oats and foxtail.*

On land that has never been cropped and is so poor that it will not raise wild oats or foxtail, you will have poor success the first year even with bur clover. Work up the soil deeply and finely; and then, because none of it has been growing on the land, it will be desirable to inoculate with bacteria. Where the ground has baked so hard, bacterial life has probably been largely destroyed.

### Bur Clover in the Bur.

*I have a lot of barley full of bur clover. What is the best way to clean or separate, and is there any market for the seed in the bur?*

Bur clover can be readily separated from barley by proper arrangement of any good grain cleaner. There is a market for the seed in the bur although the seedmen now handle only hulled seed. Any seedman will either make a bid or refer to those who operate hulling machinery. Hulled seed is better, but until a few years back the seed was handled wholly in the bur.

### Limitations of Bur Clover.

*What is the feed value of bur clover? What good as a forage crop? And its value to plow under for fertilizer? The weeds are very bad here, especially mustard and tar weed, and I want something strong to help smother the weeds.*

Bur clover is about as good for feeding as alfalfa so far as nutritive contents go. It is harder to handle as hay, however, and usually has less feeding value per ton. It is fine to plow under as a fertilizer because it is a winter grower and uses water when there is water to spare and when green stuff can be best plowed under. But bur clover is an annual and must come every year from the seed. As a smotherer it does not compare with alfalfa. It grows low and generally does not cover well enough to prevent mustard from shooting through and it dies and dries while both mustard and tar weed are waving above it. Alfalfa keeps up the weed-fight because it grows tall and because it grows in the summer and because it fights underground also with its perennial roots.

### Growing Timothy.

*What is the best way to sow timothy for hay in mountain valleys?*

Timothy is only grown in mountain valleys in the extreme north of the State, where it does exceedingly well. It is common practice to sow timothy in the fall, and after the snow melts off in the spring they have an early start. It grows there from 3 to 4 feet high and does well. About 15 lbs. of seed are usually sown to the acre.

### Winter Cover and Pasture.

*Which is the better, hairy vetch or rape, to grow as a cover crop, on gravelly, clayey soil, to use it for green feed? The ground is not inocu-*

*lated for vetch. How much would you sow per acre—alone or with oats—of both plants?*

We would not use rape in such a way. We would sow about 30 lbs. of vetch and 30 lbs. of red or black oats per acre. If your land grows bur clover naturally it is probably inoculated all right.

### Buckwheat Summer Cover.

*Is buckwheat a good summer cover crop for an orange orchard to add humus to the soil? I have been told buckwheat is hard on the land. Is that true where none of the crop is removed from the orchard?*

Buckwheat will add humus and will not hurt the land if not taken off and if the soil is not too light already. For working into sandy soil, it should not be too much matured.

### Methods With Buckwheat.

*Are the peat lands adapted to buckwheat? When is it generally sown? How handled? Is the market limited? Will it cope successfully with Bermuda grass and other weeds?*

You can grow buckwheat on low bottom land without irrigation if it holds moisture enough to make a corn crop. It can also be grown on higher land with irrigation. As it will stand no frost, it must be a midsummer crop. Broadcast like barley and harvest with a mower. Dry well before raking or it will heat in the cock. Thresh with a grain separator with proper arrangement of concaves and sieves. There is very little call for it as we in California make hot cakes out of wheat, etc. There is likely to be more call for it, as it is gaining popularity as a summer-grown cover crop in irrigated orchards. It will smother out a good many weeds, but we doubt if it will get away with Bermuda.

### Summer Forage.

*I wish to grow a summer crop for dairy cattle, upon irrigated mesa land, leveled for flooding. Which would be grown to advantage, Kaffir corn, sugar cane or millet? How much should be broadcast and when cut? Could I grow mixed with cow peas to make more balanced ration?*

Kaffir corn or some other sorghum will give you most summer feed. It can be broadcast at about 60 lbs. to the acre and cut with a mower when the stems are a quarter to half an inch in diameter. Better results are usually obtained by sowing in drills, 2½ to 3 feet and cultivating for a time. This takes about one-quarter as much seed. Cow peas require more water than sorghum and better results can be had by growing in checks by themselves, but the growth can be fed together.

### Stacking Corn Fodder.

*I cut about ten tons of fodder, and after letting it cure in bundles in the shock for about a month I put it in the barn. It was apparently*

*very dry, but it has begun to warm, and I should like to know whether I should take it out and stack in the open. If so, what is the proper way to pile it to protect it from weather?*

If the corn becomes hot enough several feet from the surface, to be very uncomfortable for the hand, better throw a large part of it out quickly and open the barn for all the circulation possible. Watch the temperature in the center, for if it gets too hot to hold your hand in, you will likely have spontaneous combustion. Otherwise would leave it in. To stack corn fodder make a bed of straw on a well-drained spot to keep fodder from ground. Then lay several bundles lengthwise of the stack to raise the center of the rest of the fodder, which should be laid in two rows with butts outward, the tassel ends overlapping to keep the center always higher than the outer ends of the bundles, to make the stack shed rain. Top off with a single row two layers deep along center of the stack, finishing the ends with butts sloping outward and downward. Straw on top of that will help keep it dry. Don't tramp it much, because that will break and waste the leaves. For convenience in using the fodder later, stack it as high as you can in short benches, one at a time. Then, taking fodder off one bench at a time from the end last stacked, none of it will bind the next bench.

### California Grass-Nut Pasture.

*I send some bulbs which grow very thickly in adobe overflow land and have a remarkable forage value for hogs after a hay crop; they are locally called "grass nuts," "wild onions," etc.*

The bulbs belong to the plant known botanically as Brodiaea laxa. The stems which grow from these bulbs in the spring of the year become one or two feet high, and each is topped with a cluster of ten to twenty-five showy purplish flowers. The leaves are very narrow and slender, and grow only from near the base of the stem. The so-called bulb is, strictly speaking, a corm—that is, a thickened underground stem structure. They grow abundantly in adobe fields and hillsides of western California, where they are known, especially in Mendocino county, as "highland potatoes." One investigator estimated that two hundred of them would often occur in a single square foot of ground. Their value for hog feeding is therefore great. They are sweet and contain considerable starch and sugar and are especially valuable for fattening. There can be no danger in the utilization of "grass nuts," unless bulbs of the "death camas" should be eaten by mistake. These, however, are not solid as are the grass nut corms, but consist of concentric layers as in the common onion. They are also readily distinguished by the flowers, which are white and are arranged in elongated panicles instead of rounded clusters, as in the case of the "grass nuts." Furthermore, death camas does not occur in heavy clay soil, but is restricted to the moist swales of meadows and stream banks.—H. M. Hall, Professor of Economic Botany, University of California.

### Sheep Like "Soft Chess".

*Please give the name of the grass of which I am sending seed-heads. Sheep like it and it runs out foxtail. Where can I get the seed of it?*

The grass from Mendocino County is the Soft Chess (Bromus hordeaceus), which has taken large areas in California, particularly in the south Coast Ranges, within the last few years. It is there considered to be very undesirable since it has crowded out better forage plants and is itself eaten by cattle and horses only when they are actually starved to it. It is probable that sheep would eat it under almost any conditions, as indicated by your correspondent, but it certainly is no grass for other grazing animals. The seed is not listed in the catalogs, but one should have no difficulty in harvesting seed, where the grass has spread so rapidly—Dr. H. M. Hall, University of California.

### Reinforcing Winter-Growing Corn.

*What is best to plant between corn rows for winter pasture in Coachella Valley? There will be considerable second crop corn in small heads that will be desirable to allow the stock to "hog off." We have in mind some variety of vetch, peas, rape or barley for feed, also for plowing in in the spring.*

As soon as the ground is moistened enough by rain or irrigation, scratch in between the rows barley and vetch together, use it for winter pasture and plow in the refuse and shallow roots deeply for the following crop. This practice is based on the fact that the corn is apt to keep on growing in your valley and to forget that it is winter by the calendar.

### Rye Grass on Ditch Banks.

*How will perennial rye grass thrive on ditch banks?*

It will hold on so far as the moisture reaches it, but it will summer kill if the bank stands dry long.

### Vetch for Winter Forage.

*On land set out to oranges this year I wish to raise some sort of crop for fodder and gotten off by May. I have been told that vetch would be best.*

Oregon vetch or hairy vetch would probably give you most crop—either to haul away or plow under. But we should rather not see it there as late as May. Get it off or under in March unless you get heavy late rains. Cover crops held late are apt to make your land hateful all summer.

### Rye and Vetch.

*I want to sow grain in my bean ground, for winter pasture for hogs and cows. Which is best to sow—oats, barley, rye or vetch?*

Sow rye and vetch. Rye is commended because of its disposition to make best early and mid-winter growth for green-feeding. (See also Part III, Vol. I.)

### Vetch and Wheat.

*I planted Oregon vetch mixed with wheat—about two and a half pounds of vetch to one of wheat. Will the two ripen together, and when should they be cut? Will the ordinary wheat reaper and thresher handle the vetch? Would it pay to thresh or would the fodder cured for hay be more profitable?*

With such a preponderance of vetch seed you are not likely to get much wheat, if the vetch suits the situation and makes its customary growth. The two plants can be cut and threshed with the same machinery, by watching and adjusting the concaves if necessary. You will have to cut before the vetch shells out if you care to get that seed. We should cut such a combination for hay, not letting the vetch get too ripe, and for cow hay the vetch would increase the value.

### Japan Clover.

*Is Japan clover, or Lespedeza, grown anywhere in California, and what is the food value compared to alfalfa? Will stock eat it as well as alfalfa when dry? Is it suitable for land in the foothills, without irriation?*

It is an annual which will not grow in most California places in the rainy season, because it is tender against frost. It will not grow much during our dry summer, because it does not like drouth. It is of no use without irrigation, and if one has water he can grow alfalfa, which is vastly superior, because it makes several times as much growth and because it does not need to be seeded every year. Bur clover is worth more to us than Japan clover because it grows in the winter and seeds itself. Japan clover was tried in California as early as 1880, and pronounced of no account. In the Southern States, with summer rains, it is well thought of.

### Growing Medicinal Plants.

*Will you kindly refer me to literature on the culture of herbs? Being interested in the raising of kitchen and medicinal herbs for market, I should be very glad of information on the kind of soil best adapted, the demand and how supplied, the securing of a market, the possible profit. Are these crops grown to any extent?*

Write to the State Forester, Sacramento, for a copy of Dr. Schneider's report on "Pharmacal Plants," which will be sent free on application. You will find suggestions of the possible profitability of these plants in the report. It is, however, not safe to enter largely upon the production of these herbs without ascertaining beforehand who your customers will be and what price will be available. They are not suitable for putting upon the general market. Special contracts are desirable before making investment of time, land and money.

# PART IV. SOILS, FERTILIZERS AND IRRIGATION

### Information on California Soils.

*Where can I get the latest and best information on southern California soils; how to tell what defects exist and how to remedy them?*

Much information on these points is to be obtained in Hilgard's "Soils," and in the publications of the University of California Agricultural Experiment Station at Berkeley, which you can find in any of the larger town libraries. Reports and soil maps of certain districts of California are available from the Division of Soils, U. S. Dept. Agr., Washington, D. C. Professor Lipman says that the great deficiency of southern California soils is in organic matter. That can only be remedied by the use of large quantities of barnyard manure where available, the continual use of green manure crops, and in addition to that, the rather limited use of tillage during the hot summer months, replacing tillage with surface straw or manure mulch in order to prevent oxidation of the organic matter introduced in the form of the first two classes of materials named above. By the addition of this organic matter, and also of the nitrogen, which in part is added by means of the organic matter, but also may be added in the form of fertilizer, the greatest defects of the soils in question can be readily remedied within a period of three to five years.

### Beet Tops for Alkali.

*I have heard that they reclaim alkali spots in the beet fields by covering with the tops and plowing under.*

The plowing under of beet tops or stable manure loosens the surface soil and thus decreases evaporation of moisture and makes the alkali weaker in the upper soil so that it may not be strong enough to prevent the germination of the seed. After starting the plant can handle more alkali and be more thrifty. But it all depends upon how much alkali there is in the soil. Plowing in such stuff is not a panacea.

### Treatment of Alkali Spots.

*I have land with some low spots seeming to have alkali. In plowing these spots plow deeper than the surrounding ground, being wet and somewhat boggy. Could these be overcome by filling in with good soil from surrounding points to a level with the other land? Would it be desirable to plow stalks or straw under in these spots? I have plenty of water for flooding and the land can be well drained. The soil around these spots is fine and produces fine alfalfa and grain, while they do not produce.*

You could reduce the accumulation of water in the low spots by filling them up to grade—in fact that is the proper thing to do in preparation of the land for irrigated alfalfa whether there is alkali or not because alfalfa will be killed out if the soil is heavy enough to hold the water too long. If the spots are alkaline you should first underdrain them to get rid of alkali, or it will rise later through your filling and make that alkaline also. Plowing in coarse stuff, before filling in, will help to keep down the alkali.

### Subsoiling in Orchard.

*I am thinking of doing some subsoiling. The trees are 26 feet apart and I would not go closer to the row than 8 feet. I plan to put three furrows from 16 to 20 inches deep down between the rows of trees. The ground has been irrigated for the last 10 or 12 years and when you get down seven or eight inches it is very hard. The trees look well. Would it injure the trees to run those furrows so deep and cutting the roots?*

You may anticipate benefit rather than injury. You can open a way for rainfall to the lower soil about as well with two deep furrows as with three and this would enable you to begin your experiment by keeping 10 feet away from the tree row. If you wish to be still more cautious run the furrows one way this year and the other way next year. Start in anyway, and be bold or cautious according to the amount of root cutting you find yourself doing.

### Cultivation of Sandy Soil.

*I have a peach orchard on "blow sand" in Merced county. I have given instruction to cultivate every two weeks, but my man objects that turning up moist sand loses moisture.*

Sandy soil which is gotten into loose condition need not be disturbed by cultivation so long as that friable condition is not interfered with and so long as weeds do not grow. It would certainly be undesirable to use any form of disk or cultivator which turned up moist soil to the air, but on loose sandy soils there is sometimes a firm, evaporating surface formed at a little depth and not on the immediate surface, as is the case with heavy soils. When this takes place there is a loss of moisture by evaporation into the dry air which readily penetrates the granular covering to the crusting place below. To prevent this the soil should be stirred by a narrow straight-toothed harrow or a disk set upright so that there may be pulverization to a depth of five or six inches without turning moist soil up to the air. If you are sure that the cultivated layer remains loose to a satisfactory depth, it need not be stirred. But be careful that a loose layer on top does not deceive you.

### Soil Crust Dries Out.

*I planted 80 acres of Egyptian corn on land which can not be irrigated. The soil is a rich mellow loam and does not crack open.*

*The neighbors advise not to disturb the top crust, claiming it would dry out more quickly. I have been informed that continual stirring of the top soil would conserve the moisture.*

It will surely dry out if you do not disturb the top crust. Cultivate shallow to keep a thin layer of loose soil on top. Deep cultivation in the dry season exposes too much soil surface to drying.

### Trouble in Soil, Not in Climate.

*Near the north shore of San Francisco Bay I have six acres of apple orchard and five acres to crop and garden. Conditions are peculiar here and trying. Every afternoon during the summer we get a westerly trade wind that continues well into the night. During June we had temperatures ranging from 90 degrees at noon to 50 degrees at 8 p. m., accompanied by a cold fog. This extreme in 24 hours seems to check all plant growth. Peas bloom when 6 inches high; beans remain stationary at 12 inches; corn makes little growth and turns yellow. Squash, vine, etc., are thrashed to pieces by the wind and all stuff grows so slowly it seems tough and tasteless. What crops can one grow under conditions of this sort?*

You are blaming the climate too much. Your land needs trenching (or at least deep plowing) and a heavy bombardment with stable manure. This would feed the plants and hold more moisture for them. Your land must be made more loamy—whether it be now either too sandy or too hard, and plenty of organic matter will help it in either case. Your working last winter was too shallow or too late, so that much rainfall moisture was lost and your planting of all the things you mention was too late. The poor growth of plants you describe is caused chiefly by drying out and not by the temperature. With manure and better tillage the corn will grow high enough to wind-break the squashes and other tender foliage. Get manure, save moisture by better tillage, get more busy and get busy earlier in the rainy season. Your climate is like that which prevails on the lower lands in most northern Coast valleys, and it will make good crops if the soil is fed and worked right.

### Probably Too Much Alkali for Peaches.

*On land, too high to flood from irrigating ditch, I planted apricot trees which grew finely until August, when most of them died, and the balance died this winter. For two years previously I had planted peach trees, but they also died the same way. I am thinking of placing a 2-inch centrifugal pump on the bank to pump water out of the ditch. Each year I have tried to keep trees alive by watering with hose from tank-house, but have failed. The land on the surface looks right, but when digging holes for trees it shows a little alkali, but does not seem to me too strong.*

If it were simply a case of dying from drouth, you could easily settle it by pumping from the ditch as you propose. Pumping from ditches to higher lands is done on both large and small scale in all

parts of the State. But the probability is that your trees did not die from drouth. They died too suddenly and uniformly for that. Some of them would surely have pulled through with the hose irrigation you gave them, even if inadequate for good growth. It is altogether likely that there is too much alkali. You can have that determined by sending a sample of the lower soil to the Experiment Station at Berkeley, and sending a letter with it describing what your experience has been. It may be that the land would carry pears even if too alkaline, when you get water on it, for peaches and apricots.

### Lime and Chicken Manure on Clover Lawn.

*Can I fertilize my lawn (mostly clover) with fresh chicken fertilizer, in which there is a generous sprinkling of lime. Will the lime prove detrimental instead of enriching the soil? I intend to apply it, and if it isn't raining will turn the sprinklers on, to get it close to the roots.*

Lime is one of the best things for clover, for clover will not do well unless there is plenty of lime in the soil. Too much fresh lime might do harm, but being exposed to the air takes out the bite. Mixing lime with manure, however, is not good, as lime drives off nitrogen—the best part of it—and you should use gypsum rather than lime for the hen houses.

### Danger in Fertilizing at Planting Seeds.

*When I planted rhubarb seed I put a little commercial fertilizer in each hill, but in the hills I put it in only a few seeds came up. So when I planted some peanuts I put about a teaspoonful in each hill and mixed it with the ground, but only a few of the hills that I put it in came up. Did I get it too strong?*

It is always dangerous to use a quickly soluble fertilizer in contact with seed, and it is otherwise undesirable. No thrifty plant keeps its roots where the seed starts; they go forth considerable distances after moisture and plant food. If, however, you still wish to get right on the spot, mix the fertilizer with several times its bulk of fine sandy loam well pulverized, and it will work on the plants and not get too much in one place. On the whole, however, it is better to get the fertilizer into moist earth between the rows and invite the roots to go after it.

### Do They Need Irrigation?

*Will it pay to fall irrigate a prune orchard (where the water stands 10 feet below the surface) for the fruit buds for the next crop?*

Take a look at the trees and see if the leaves at the growing tips are well nourished and the general aspect of the foliage indicative of vigor or otherwise. Then dig down to a depth of three or four feet and see if the soil in which the roots are growing is moist enough to ball in the hand with pressure. If the soil is manifestly too dry at that depth, irrigate as soon as the fruit is gathered. Another condition indicating desirability of irrigating your trees would be the coming of the

fall rains. If you are pretty sure of good rains in September and October and the trees are looking well when the fruit is gathered, the probability is that they do not need irrigation.

### Windbreak on Irrigation Ditch.

*What deciduous tree will make a good erect windbreak along an irrigation ditch in the San Joaquin Valley? How far apart should they be planted?*

If you want it very upright nothing beats the Lombardy poplar and by planting close, say 20 feet, you can get an effective windshield. It does well in your valley.

### Underground Irrigation.

*What is the best way to subirrigate citrus trees and where is there published information on the subject?*

No method has been demonstrated to be of continued value and success. Since 1870 every kind of subterranean distribution has been tried, including board boxes, cement pipes or tiles, perforated or otherwise, iron pipes with various outlets—all these have been tried and abandoned. The literature on the subject consists of descriptions of patented systems in the publications of the U. S. Patent Office and subsequent announcements of their undesirability in the horticultural journals. Often one hears of the success of fruit on "subirrigated land," but the term applies to land moistened by gravity or lateral seepage in the form of natural underflow, and does not indicate any method of artificial subterranean distribution. (For subirrigation in gardens see Part IV, Vol. 1.)

### Irrigating Sorghums.

*I have planted Egyptian corn. The ground was thoroughly watered before planting and the corn is just now coming up. The soil is getting very dry on the surface. I have been told that Egyptian corn should not be watered at all. Would you advise permitting it to go through the dry hot months without irrigation? If not, when and how often should it have water?*

The sorghums are especially valuable for drouth and heat toleration, and because they will give most growth with least water, but that does not mean that they do not enjoy moisture. They make amount of growth proportional to the moisture available and will grow from six inches to six feet high according to the soil moisture available. Therefore, unless your ground is naturally moist, you will get more green feed or grain by irrigation, the water being run in furrows between the rows, or flooded if sown broadcast. How much and how frequently irrigated depends upon whether the soil is retentive or not. Ordinarily irrigation once a month is desirable. Watch the plants and keep the foliage from yellowing until it is natural for it to mature the seed. Whether you will irrigate or get the most you can without it, good cultivation while the plant

is growing is the surety of a good product, unless the land is naturally moist, and then the plant should be kept clean of weeds.

### Irrigating Almonds.

*I lost about 40% of my young almond trees this year on account of drouth, but now have a good well and pumping plant so that I can irrigate the trees next year. My advisers say that if the almond trees are irrigated the trees will not become as deeply rooted as they would if the top of the ground were kept dry, forcing the roots to go downward for moisture.*

Irrigation of almond trees on a deep, free soil such as should be selected for the almond, will not produce undesirable surface rooting, if the irrigation water is applied in considerable amounts so as to secure deep penetration rather than frequent light applications which would confine the moisture to the upper layers of the soil. Rational irrigation is good both for young trees and old and irrigation water is desirable always in case rainfall should be inadequate. There is no need to be worried about it; if the soil does not have moisture enough, irrigate and be glad that you have the water.

### Blasting a Well Bottom.

*I have been advised that by using dynamite in the bottom of the well, so as to blast out quite a basin and then sand pump out all possible, that it will make a much better well.*

There is grave danger of destroying the well by blasting and generally no well driller will dynamite a well unless the owner assumes all responsibility. A well should not be dynamited where the water bearing strata are ordinary water-gravel and sand. If such a condition exists, to develop an open-bottom well, end the well in the water-bearing stratum itself and do not pass through this and land in the clay. If the well ends in the water strata, develop the well with a centrifugal pump and have a well with a large cavity or reservoir at the bottom. There is, however, a certain amount of danger in the gravel and sand flowing too fast and sanding the well. If all the water will be obtained from a stratum of shale only, and the well does not supply sufficient water after test, then try dynamite, but this is for a shale or a sandstone stratum only. —E. P. McMurtry.

### Increasing Output of Wells.

*I have a 10-inch well, cased 100 feet deep. Good water gravel was encountered at 34 feet 4 inches, at 65 feet 8 inches, at 90 feet 3 inches, and at 106 feet 3 inches or more. The best wells in the valley yield only 400 gallons per minute, and I want more. I am advised to sink a dug well, say 5 feet by 6 to include the two upper strata of gravel and, if found necessary, mine a tunnel at right angles to the vein of water gravel, so as to get all the water.*

We would not recommend this method. The cost of tunneling below the water line is very expensive and unless the ground on each side of the water stratum is of solid clay it would be necessary to curb the tunnels, which, if done with redwood, would last but a short time and if of concrete would be very expensive. Obtaining water by tunnels is commended where there is one stratum only a short distance below the ground and a foot or two in thickness only or where the character of the water-bearing strata is so close, such as shale or sand only, that sufficient water will not flow through to an ordinary well. The tunnel method increases the percolating area and increases the supply. Our recommendation would be to sink a pit to the first water, drill one or more 10-inch wells, 20 to 30 feet from the present well, run narrow tunnels, which in this case will be above the water line, out to these new wells and connect all of the wells with proper pipes to one vertical centrifugal pump placed in the pit. The cost of drilling additional 10-inch wells will be very slight compared to the cost of the tunnel method.—E. P. McMurtry.

### Linings for Irrigation Ditches.

*Please give information about cementing or lining a ditch, as to the best and cheapest way and approximate cost.*

From experience with the efficiency of the different types of linings, the following results can be anticipated: 1. A good oil lining, constructed with heavy asphalt road oil, applied on the ditch sides and bed at the rate of about 3 gallons per square yard, will stop 50 to 60% of the seepage. 2. A well-constructed clay puddle lining is as efficient as a good oil lining. 3. A thin cement mortar lining, about one inch thick, made of one part cement to four of sand, will prevent 75% of the seepage. 4. A first-class concrete lining, three inches thick, made of one part of cement to two of sand and four of gravel, will stop 95% of the seepage. 5. A wooden lining, when new, is as efficient as a concrete lining, but after two or three years repairs will become an important item, and by eight or ten years will require complete renewal.

The cost of an oil lining where oil can be bought at California prices (about two cents a gallon) is about one-half cent per square foot. Cement mortar lining one inch thick costs about 2 to 4 cents per square foot. Cement concrete two inches thick costs from about 4 to 6 cents, and three inches thick from about 6 to 8 cents a square foot. These prices do not include the trimming and preparation of the ditch before the lining is put on, which would add from ¾ to 1½ cents per square foot. If clay is close at hand it can be hauled and spread on the canal, then either tramped in by cattle or worked in by dragging chains over it, at a cost of less than 1 cent per square foot, but there are localities where enough money has been spent on clay linings to pay for a good concrete lining. Wooden lining built of two-inch lumber nailed on sills and side yokes will cost as much as a two-inch concrete lining and is not nearly as durable.

An oil lining stops only a part of the seepage losses, and while it will resist erosion well, it probably will not prevent the growth of weeds

for more than one season unless a high velocity is used, and it will not stop the activities of burrowing animals. Clay puddle will not prevent the burrowing of animals and weeds grow rapidly, especially since the velocity of the water must be small in order to prevent the eroding or washing of the lining. A concrete lining has none of these disadvantages and the only objection is its higher first cost. But where water is valuable its expense is well justified. In southern California the use of concrete lining dates from about 1880, when the increasing value of water made it necessary to do away with losses. Since that time practically all canals in that section have been lined with concrete, and in some cases replaced with concrete pipes.—Prof. B. A. Etcheverry.

### Oiling Irrigation Hose.

*What is the kind of oil to soak cloth hose in, to preserve it and to keep it from leaking water?*

Use boiled linseed oil, to which has been added a liberal amount of litharge, for drying purposes. Apply with an ordinary paint brush.

### How Much Water for Four Acres?

*How much water do I need for four acres of heavy loam in fruit trees—mostly young trees?*

It requires local experience to tell how much water is needed in any place, and some wideawake neighbor can advise you exactly. Theoretically you might expect to carry 950 trees, while they are young, with one miner's inch continuous flow, delivered in multiples, of course, according to the number of days intervening between the runs. The duty of that much water will depend upon the retentiveness of the soil; also upon how well you handle the water and how much you conserve by good cultivation.

### Water Conduits to Take Less Land.

*I am laying out some ditches to carry about 4.2 second feet of water. There is a ditch described in Farmer's Bulletin 375, having this capacity of 4.2 second feet. It takes up too much land as it is 12 feet wide over all. Would it be possible to make a ditch with very much steeper banks than the one mentioned by oiling it with an asphalt base oil to protect it from erosion? The soil is clay loam.*

The ditch to which you refer can be built with steeper slopes, so that it will not need to take over about eight feet of ground if slopes of 1:1 are used. The use of the asphalt base oil would not probably be of any particular advantage, as a clay loam soil would probably stand on this slope. To save the land, an 18-inch pipe would give about the same capacity as this ditch. Also a flume, 18 inches wide by 12 inches deep, would carry the same amount of water. The pipe could be buried, so as to require practically no space and the flume would also need little width.

### Laying Pipe Before Leveling.

*A and B each bought land in a tract owned by a development company. The company reserved the right to lay irrigating laterals across the land. This they laid at a uniform depth across the land in its natural state without taking into consideration the contours as reported by their civil engineers. When the land was leveled so that it could be irrigated the pipe line was exposed so as to prevent farming across it. Will A and B be obliged to lower the pipe at their own expense, or should the company pay for their own negligence?*

Each instrument reserving the rights of way for irrigating laterals, etc., must be carefully interpreted in order to understand the conditions for which it was drawn. If there is no specification regarding the size, location and method of constructing the conduit, the rule of reasonableness alone governs. If, considering all existing conditions, the conduit has been laid in an unreasonable manner, the company is liable.

### Bermuda on Reservoir Bottom.

*I have a reservoir covering an acre which has a complete sod of Bermuda grass in the bottom. What would your idea be of the most practical way to get rid of it? Could it be done with distillate?*

If you wish to remove the Bermuda so that you can work the soil bottom to make the reservoir hold water, undercut the sod with a weed knife or flat-tooth cultivator, dry, rake into windrows and burn and then get on with your harrows, clay, sheep, etc.—whichever you choose to use to puddle the bottom. If you wish to kill the top growth, distillate will do that, but it will not get the bottom of the Bermuda. It will come up again when it gets ready, providing the surface has air and light. But if it is simply a question of killing the Bermuda on the reservoir bottom, why do you worry? Fill the reservoir and that will settle it. Bermuda is not an aquatic plant. It will probably climb out over the banks, but that will not be a bad idea; it will keep the banks from washing.

### Oil Lining for Reservoirs.

*Is it practical to cover the bottom of a reservoir with heavy oil to overcome seepage—say such oil as they use on the roads in California? Or would the oil rise on the water and go out on the alfalfa when irrigated?*

It gives satisfaction and there are a number so constructed in this State. You must get an even distribution. The oil must be thoroughly mixed with the soil for several inches deep and rolled hard, then no more oil is taken up from the bottom than there is from a road in a rainstorm, and that is not enough to do harm. Possibly the first time the reservoir is filled the water might take off an appreciable quantity, depending largely on the way the oiling was done, but later no trouble would be expected, and a very impervious bottom would be secured.

### What Is "Horsepower."

*I have been told that a horsepower is just the same on all kinds of engines, and that a* 20 *horsepower automobile, if harnessed for it, could do the same work as* 20 *horsepower stationary engine. I would like to know if this is true.*

Yes: whether it be a draft animal, or an engine, or a gale of wind, or a kicking burro, or a stick of dynamite, it is a theoretical horsepower if it can lift 33,000 pounds one foot high in one minute; actual horsepower, however, is whatever horsepower is really developed as proved by trial. Whether you can use a thing able to do this, under certain conditions, depends upon the working requirements of the machine or agency and its environment. The tides of the ocean have more horsepower than all other earthly motors combined, but to cultivate a row of corn we would rather have a lame mule.

### What a 2-Inch Well May Do.

*Is it possible to pump water out of a 2-inch cased well fast enough to water* 10 *acres of young fig trees?*

It depends upon how good your pump is and whether there is plenty of water in the well; also whether your soil will carry water well in a furrow, or whether it will only run a few feet and sink out of sight. Supposing the pump is good, the well wet, the soil furrow fit to carry water, and the trees blocked up and not stretched out Indian-file, you can surely irrigate ten acres of young deciduous trees in one or two furrows to the row as many times as the trees need it—providing the rest of the land is idle and kept well cultivated. If you have to fill checks or if you wish to irrigate inter-crops, you would need a reservoir or a larger well and pump, or both, perhaps. In the former case your head-ditch should be a flume or a pipe, so as not to lose water before it gets to the furrow heads. As your trees get larger you will probably need a larger well and pump.

### Work and Cost of Pumping Plant.

*I have a bored well cased, seven inches in diameter,* 100 *feet deep; abundant supply. What is the best method of obtaining the greatest supply? What horsepower engine and what sort of pump, also probable cost?*

To answer this one should know the distance at which the water stands in the well when not being pumped. Also the amount of water that is needed, if for domestic purposes, or the number of acres of land, if for irrigation. In either case it is simply a matter of size of pump and size of engine, which is controlled by the amount of money the owner wishes to invest. Water for domestic supply can be accomplished by a lift pump at the rate of from 15 to 70 gallons a minute. The cost is controlled by the number of feet the water has to be raised and the number of gallons per minute required. If a lift pump, several parts

must be considered. They are: a cylinder in the well, a number of feet of pipe from this cylinder to the point of discharge, a pumping head, either geared or belted to an engine or motor, and a gas engine or motor. For a supply of 15 gallons a minute and a lift of 100 feet the cost would be as follows:

| | |
|---|---|
| Cylinder | $ 9 to $14 |
| 100 feet of pipe at 12c | 12 |
| Pumping head | 14 to 25 |
| 1½-horsepower gas engine | 75 |
| Approximate cost | $125 |

For a supply of 70 gallons a minute and a lift of 100 feet:

| | |
|---|---|
| Cylinder | $ 20 |
| 100 feet of pipe at 20c | 20 |
| Pumping head | 60 |
| 5-horsepower gas engine | 150 to $350 |
| Or 5-horsepower motor | 68.10 |
| Approximate cost | $250 to $450 |

(Running cost probably more.)

Gasoline used would be about one-fourth gallon per horsepower per hour.

For irrigation purposes one is again controlled by the amount of water needed and of money to be invested; the number of acres to be irrigated, the local rainfall and its distribution, and the number of feet the water is to be lifted. A centrifugal pump would probably be chosen in this case. The cost varies with the quantity of water required and the distance it is to be lifted. Doubling the lift or quantity of water handled also doubles the power required and the cost rises in proportion. With a centrifugal pump it is necessary to dig a pit to the water surface in the well, as it is not advisable to suck water over a suction-lift of from 20 to 25 feet to the pump. The price of the digging varies with the size and depth of the pit from $1.00 per foot up. The water level controls the depth of pit. We shall figure on a discharge of 200 to 225 gallons a minute which is sufficient to cover one acre six inches deep in a twelve-hour run, not allowing for loss by seepage. Based on a pump efficiency of fifty per cent with a lift of 30 feet a discharge of 200 gallons a minute may be obtained with 3 horsepower, while with a lift of 100 feet, 10 horsepower will be necessary to discharge the same amount of water. It is simply a question of power, lift and quantity required. Doubling the lift or doubling the quantity doubles the power needed. With the 30-foot lift one would use a No. 3 horizontal centrifugal pump, which pumps about 225 gallons per minute and costs from $100 to $150. A 5-horsepower gas engine or motor would be used with this lift and size of pump. The engine varies in price from $200 to $350, but the initial cost is a small item compared with economy in operation as time goes on. There are engines on the market costing $350 which consume only one-half gallon

of stove distillate an hour at the rate of less than 5 cents a gallon. This would allow a run of twelve hours for 30 cents. Gasoline at 15 cents a gallon would bring it up to 90 cents. A motor of the same horsepower would cost about $70 and use about 4 KWH of power an hour. At a power rate of 3 cents a KWH a twelve-hour run would cost $1.44. In the case of a 100-foot lift, one would prefer a 15 horsepower gas engine or motor and a No. 3 vertical centrifugal pump, two stage. The engine would cost up to $640 and would use two gallons of stove distillate per hour at 5 cents. Thus a twelve-hour run would cost $1.20. A motor of the same size would cost $190 and would use 11 KWH an hour. At an average of 2½c a KWH a twelve-hour run would cost $3.30. Though the motor costs a great deal less in the beginning one should study the local power rate schedule and figure on the cost of operation as time goes on. The approximate costs of the two lifts are as follows:

30-Foot Lift

| | | | |
|---|---|---|---|
| Pump | $100 | Pump | $100 |
| Engine | 350 | Motor | 70 |
| Pipe | 15 | Pipe | 15 |
| | $465 | | $185 |

100-Foot Lift

| | | | |
|---|---|---|---|
| Pump | $330 | Pump | $330 |
| Engine | 640 | Motor | 190 |
| Pipe | 50 | Pipe | 50 |
| | $1,020 | | $570 |

So we are impressed with the fact that the lift and equipment chosen have a great deal to do with the installation, to say nothing of the cost of maintenance and operation.—Holter & Rogers.

### Pumping for Alfalfa.

*Is it possible to pump water* 100 *feet for alfalfa and make a good profit, when alfalfa will sell for* $10 *per ton or upward? Water is in abundant supply. From one well a flow of from* 1,000 *to* 1,500 *gallons per minute can be secured.*

With the cheap fuel engines now on the market the fuel cost is comparatively low. Take a crude oil engine that is said to burn oil of as low as 24 degrees gravity. We wish to pump 1,200 gallons per minute. This will require a No. 7 pump. To raise this amount of water a distance of 100 feet a 75 horsepower crude oil engine will be needed. This engine consumes, say, from 9 to 10 gallons of fuel per hour at from 2 to 3 cents a gallon. Take the higher figure and the fuel cost will be 30 cents an hour or $3.60 for a 12-hour run. The water will cover 3½ acres 6 inches deep. Practically a cost of $1.00 for each 6-inch irrigation, or $5.00 an acre for a 30-inch irrigation for the season. Cost of attendance

will amount to another $1.00 for each 6-inch irrigation, or $5.00 per acre per season. Thus the total irrigation cost will amount to about $10 per acre per season. One should expect at least 5 tons to the acre of alfalfa per season, which will give a gross return of $50. Deducting $10, for irrigation costs, $40 remains to be divided between field attendance, harvesting costs and profit. The 75 horsepower crude oil engine costs about $3500 and the No. 7 pump may be obtained for about $400. Probably a simpler and cheaper way would be to build a reservoir at the highest point to be irrigated. A smaller crude oil engine and smaller pump, which can be run continually, may then be used. Thus 24 hours' pumping will afford 12 hours' irrigation at a nominal cost for fuel, fixed charges and attendance. The smaller plant will give a proportionally higher cost for fuel consumption, but the cost of attendance can be greatly reduced. The area to be irrigated and the amount of water to be applied through the season will control the economy of raising water 100 feet for alfalfa production. The amount of water to be pumped, or the height it is to be lifted, is simply a question of power, and, in this case, cheap power. Alfalfa should have at least 30 acre inches of water per season. To put a depth of 2 feet of water on one acre, it takes a flow of 450 U. S. gallons per minute for 24 hours, irrespective of losses by seepage, which is very important. Knowing the acreage, one can figure the number of days required to cover a field to a given depth. From this the cost per acre may be figured.—Holter & Rogers, San Francisco.

### Who Owns Underground Water?

*I bought land, the deed of which says that I have only the use for domestic purposes of any of the waters arising on or flowing through or over the property, and the company has the right to the water's uninterrupted flow through and over the property. Can I dig a well and pump for irrigation?*

Many lands have been subdivided and sold in small tracts with the reservation that all waters, either surface or underground, on or under such land, shall remain the property of the original company, with the exception that the purchaser may use water for domestic and irrigation purposes on the tract purchased. From his account it seems that the writer above is given the right to use water for domestic purposes only. The deed will have to be inspected in order to ascertain his right to develop underground water. He has title only to what the deed conveys.

### Running Ditches Across Others' Land.

*I own a pumping plant and can sell water provided I can get it across intervening property. Can the owner of this intervening property stop me from running the ditch if I pay him a reasonable price for the privilege?*

By statute adopted in 1913, anyone distributing water to land not owned by himself must be considered a public utility and subject to regulation by the California Railroad Commission. Being in public service, the owner of such a system would have the right to condemn a right-of-

way, the cost of which would have to be fixed by a jury. It would undoubtedly be in excess of the ordinary acreage price of the land. The only way to avoid being a public utility in such a case would be to sell an interest in the pumping system to those whose lands are to be irrigated. Under such conditions the system would no longer be considered in public service, and it would therefore not have the right of condemnation. It would have to pay whatever the owner of the land desired for the right-of-way.

### Riparian Rights and Winter Irrigation.

*I have land on a creek which flows a good part of the year. I want to put in a pipe so that in the winter, when there is a good stream flowing I can give irrigation and be sure that no one can stop me after the pipe has been installed. I plan to buy land on both sides of the creek above me, to give me the necessary head. If I file a water right on a certain part of the water, will that give me a clear right to use it?*

As a riparian owner you have a right to take and use water flowing in the creek, which right must be shared with other riparian owners. As you desire to irrigate when there is "a good stream flowing," the probability is that at that time there will be sufficient for all riparian owners who care to use the water. If any lower riparian owner objects, a division must be made so that each will have a reasonable use of the full flow. There is no necessity of filing a notice of water appropriation, as the right acquired thereby is inferior to the riparian right. Any riparian owner can enjoin the diversion of water by a mere appropriator.

### Riparian Rights.

*I have a water right on a creek that flows through my lands. A neighbor above me, who has never filed a water right, claims that he is entitled to take water from the creek from the fact that he has been taking water from it for a good many years prior to my filing a water right. Is he right?*

From the statement that the creek flows through the land, it is assumed that all of the land lies along the bank of the creek and is, therefore, riparian thereto. As a riparian owner you are entitled to a reasonable use of the waters of the creek in common with all other riparian owners. A riparian owner, or an appropriator above you may have secured a better right to the water by using it to your detriment for a period of five years—thus acquiring a so-called prescriptive right. There are a number of elements entering into the determination of a prescriptive right and the one so claiming it must submit proofs. It is therefore certain that where an upper owner has within the past five years started to divert the water from the creek and use it upon his land, he has no greater right to do so than any other riparian owner below him.

### Irrigation or Fertilization.

*If it is advisable to keep the tree growing and thus hold its foliage till as late in the season as possible in order to strengthen the fruit*

*buds, why is it that they practice fall pruning, denuding the tree of nearly all foliage and exposing the fruit buds to all the sun and light they can get? I don't think that fall watering of the prune will cause it to produce heavier crops. My idea is that the soil needs nourishment.*

It is well to place emphasis on the need of fertilization and fall irrigation is not at all at enmity with that claim. However, one can never be sure that the tree needs fertilizers until he has given it a chance to grow well and bear well under the influence of adequate moisture. Besides, the tree can only use fertilizers when there is enough moisture present. But on the other hand it may be urged that in many cases if ample humus is present by cover crops or stable manure the soil will be more retentive and the trees stand in less need of fall irrigation, and that is true. In fact, irrigation and fertilization are so intimately related in effects that one should never try to stand one off against the other. The wise grower assures himself that the tree has moisture enough, and if water does not help the bearing, turns to fertilization. Every kind of a fruit tree must have moisture enough to hold foliage active until fruit buds are adequately strong and to protect the tissues of the new growth against desiccation (as shown by shriveling in extreme cases). When the soil is dry and rains late, this moisture must come from fall irrigation. This lesson has been clearly learned in the San Joaquin Valley with peach trees and when a tree has fall moisture enough to keep it in good condition it is protected against starting too early from its dormancy.

### Purity of Domestic Water Supply.

*Will a cesspool dug to gravel and a few feet from water table have any effect on the water of a drinking well 100 feet away? Would there be danger to health and fear for the typhoid germ? Is it sanitary to keep an elevated water tank covered that is used for household purposes and drinking? Will the water keep pure and sweet?*

Putting in a cesspool as you describe is dangerous as in the loose gravel there is quite sure to be a movement of injurious material from cesspool to well and typhoid could easily be carried to user of the water. If, however, you have a bored well and the gravel stratum with which the cesspool connects is cased off, there can be no practical danger. It is sanitary to keep a tank covered. Better to do that than allow it to remain open to injury from birds and other sources of contagion. Whether the water remains pure and sweet or not depends more on the amount used than anything else. If the water is frequently renewed, a covered tank will give good water.

### Reclaiming Overflow Land.

*How can I reclaim a piece of swamp land that is flooded by water from a creek, caused by the tide from the ocean? It is well drained as the tide recedes, and it can easily be shut out.*

Shut out the salt water, of course, and give the fresh water a chance to get out when the tide recedes. This is usually done with a levee with gates in it, at the lowest points, which close as the inflow begins and are pushed open by the outflow. These can be made to work automatically. It sounds easy, but it isn't always easy or cheap.

### Behavior of a Tight Soil.

*If I bore fifteen feet and strike water, which rises to within five feet of the surface, is my water table five or fifteen feet? I cover an acre of land with water, and I find that it goes into the ground at the rate of one-eighth inch a day. Under the above conditions, do I stand a fair show of washing alkali out of the soil?*

Your water table is practically at five feet unless you have broken an impervious hardpan in boring—which, if not broken, might hold down water below it. Under the conditions you describe the water-movement is too slow to wash out alkali. You will have to dig deep, open drains or lay tile to move away the water faster. The one-eighth inch of which you speak is partly lost by evaporation, probably.

### Preventing Flow of Waste Water.

*Has the man below a legal right to build temporary dams on his own land, to prevent waste irrigation water flowing in storm-water channels during the irrigation season when there is no storm water? Can the man above be legally restrained from making use of storm-water channels to get rid of his waste irrigation water where such use will lead to damage of the land below at a time when there is no storm water?*

It is well settled in California that the owner of upper lands has a right to the discharge of surface or rain water as it is accustomed to naturally flow. He, however, has no right to change the natural mode of discharge to the injury of the lower land owner. The upper land owner can, therefore, be restrained from discharging waste irrigation water (that is, not natural waters) into storm-water channels, if such discharge damages the lower land owner. As the lower land owner has this right of injunction, he may also throw temporary dams across storm-water channels on his own land to prevent said waste irrigation waters from doing injury to his land.

### Draining Low Places.

*I have a large depression in my land where I lost about 100 vines and when we irrigate the water makes a lake for several days. In another place there is a squirrel hole and water runs into this hole for several days with no sign of filling it up. If I could put a large hole in the low spot and keep it open would it not take care of the water? I put a hole down in this place last March; we struck mud at 12 feet. Later the water came up about eight feet more and remained at that level for a long time.*

Frequently it is possible to drain low places entirely surrounded by higher ground by digging a hole such as you suggest. Go down until you reach sand or gravel through which the water can flow easily. Many large swales have been reclaimed in this way, but to be successful the stratum of loose material must be reached, and sometimes it is too far from the surface to make the work profitable. In your case if such gravel stratum occurs it evidently is below the bed of mud and probably separated from it by hardpan which you must get through. The only other way to drain will be by putting in tile drains to take water to lower ground—digging deep enough through the sides of the depression to allow the water to run off. If you put in tile to draw the water down to three and one-half feet below the surface, you need not worry about the water below that.

### Uses of Saltpetre.

*What about the use of saltpetre as a fertilizer of crops? I have seen it stated that it has been used with great benefit on garden crops.*

It is Chile saltpetre or sodium nitrate which is used as a stimulating nitrogenous fertilizer. When the term saltpetre is used in connection with preservation of meats, etc., it means potassium nitrate which is too expensive for use in fertilizers. Chile saltpetre is largely used in the way you mention and it can be bought from all fertilizer dealers. Great care must be taken, however, not to use too much and not to apply it in quantity near the plants. The usual dose is 200 pounds per acre, well distributed. That is perfectly safe and considerably more may be sometimes used to advantage; but increasing the dose should be carefully done after some experience has been gained in the use of it.

### What Is Meant by "Nitrate Spraying".

*What is meant by "nitrate spraying" in connection with insecticides to stimulate fruit trees?*

In 1912 W. H. Volck, horticultural commissioner of Santa Cruz County, and Mr. Ballard of the U. S. Department of Agriculture, sprayed apple trees which previously had refused to bear with a solution of nitrate of soda and they bore large crops of fine apples. Unsprayed trees were unproductive, although as much nitrate of soda was applied to the roots as was put on the tops of the first lot, the advantages all coming from the spraying, apparently. Messrs. Volck and Ballard continued the experiments, with favorable results and the practice was taken up by Watsonville growers. The dose is one pound of nitrate to a gallon of water, or sometimes half a pound to the gallon. It can be applied with ordinary lime-sulphur or other sprayings, or by itself with about 15 to 20 pounds of caustic soda to the 200 gallon tank added to make it stick to branches. At first it was thought that it should be applied when the buds were swelling, but later it was shown that it can be applied any time to dormant trees.

### Pie Melons Poor Fertilizer.

*We have a large quantity of volunteer pie melons in the vineyard and are selling them at a dollar a load. Would it be better to allow them to rot on the ground as fertilizer?*

Sell them, unless you can feed them to advantage. They surely are not worth a dollar a load as a fertilizer.

### Potato Vines as Fertilizer.

*How can I best use potato vines for fertilizer? They seem to enrich the ground when plowed under or mixed with other manure, but they help to perpetuate the potato disease, which I am trying to eliminate by disinfecting seed, rotation, etc. Is there any way to disinfect the vines, or don't you think they are worth it?*

They are not worth the labor and chemicals required for disinfection. Plow them in and use the land for grain or hay or other crop which is not affected by potato diseases. That is one of the advantages which pertain to rotation. This would bring your potatoes on ground new to them each year and your question disappears.

### Price for Poultry Manure.

*What is a proper price for poultry manure free of sand and feathers, and put up in sacks? I find that a sack of the dry manure weighs about 60 pounds, and my idea was to run it through a fanning mill so as to blow out the feathers and screen the sand so as to leave the manure clear and clean. As I have had the poultry running in the peach orchard for twenty years I well know the value of this manure.*

The composition of hen manure (fresh) averages about 1% nitrogen, 0.80% phosphoric acid, and 0.40% potash; in other words, 20 pounds nitrogen per ton, 16 pounds phosphoric acid, and 8 pounds potash. This contains 55% moisture and when thoroughly dried would contain probably only about about half as much, which would make the amounts of plant foods just double what is stated above. At the values given by the State Fertilizer Control for these plant foods, the manure prepared as you describe might sell for about $10 per ton, for the same materials in other forms could be purchased for about that price.

### Fertilizing Young Trees.

*On an acreage of pears and apples, most of them two years old, I desire to use fertilizer. Thus far both apples and pears look well, but feel that I should fertilize.*

If the trees made enough wood growth and had good-sized and colored leaves, it is a question whether fertilizing would be any advantage at this stage of their growth. It is the same way with irrigation: if one gets good growth on a young tree, neither irrigation nor fertilization is necessary; but both may be very necessary later and probably it will

be more useful to take to irrigating first, because in a shortage of moisture fertilizing must be ineffective. However, if there is stable or corral manure available we would get it and top-spread it in advance of the rains and turn it in with the green stuff whenever it is right to plow on that land. This will not only increase the plant food, but will make the cultivation easier and better and prepare the way for profitable use of commercial fertilizers later.

### Excess Ashes and Mottle-Leaf.

*Before my orange trees were planted, two years ago, brush was burned on one corner of the land. The trees planted there show mottling. As a rule the trees look well and are vigorous. Could there be an excess of alkali due to the presence of the wood ashes? If so, how can we correct it?*

Possibly excess of potash caused the trouble. The way to remove the potash is to leach it out with water or in this way distribute it through a greater bulk of soil. If the soil is loose and distributes the water well, simply irrigate generously from time to time. If water stands, however, you must underdrain the spot or you may give the trees something worse than mottled leaf. Unless you burned a large amount of brush in that spot, however, the possible excess of potash would disappear soon, under ordinary irrigation and rainfall.

### Lime, Litmus and Daffodils.

*Will a top dressing of air-slaked lime, sprinkled and cultivated into a bed of daffodils, do any harm to the young roots already started? They have been in but a short time, but I find on testing land with blue litmus paper traces of sourness.*

A good whitening of the surface with air-slaked lime is not dangerous if soon followed by rain or sprinkling. It might not be advisable with some small seeds, but larger seeds do not object and growing plants or bulbs are not injuriously affected. The litmus test is good if one has had experience enough not to attach too much importance to slight colorations. If various plants are growing well, the soil is not injuriously acid. The lime, however, if not used in excess, will do no harm and may do good in several ways.

### Carbide Refuse as Lime for Soil.

*Can carbide refuse be used beneficially on vineyard, orchard or alfalfa land?*

The lime in carbide refuse is excellent for soil where lime is needed. If used too fresh it may contain some carbide which might injure the roots if turned under at once, but when the refuse is exposed fully to air and moisture for some time all this carbide passes off and the rest is practically like water or air-slaked lime.

### Lime and Gypsum in Gardening

*How much air-slaked lime should be applied per 100 square feet? Is gypsum as desirable as lime for rendering the soil friable?*

You can use 5 pounds of lime to the 100 square feet. Lime is more energetic than gypsum in promoting friability. Gypsum is a safer plant stimulant than caustic lime.

### Horse and Cow Manure.

*Is horse manure the equal of cow manure in gardening?*

Both horse and cow manure are good. The latter may be as good as the former for plant food—that depends upon how well each kind of animal is fed. Cow manure is less likely to ferment rapidly and produce too much heat, and for that reason horse manure is specially good for use in hot-beds.

### Lime and Other Fertilizers.

*Is it wise to put lime on land that has become sour, when the trees and vines are growing? It is light land. How much to the acre, etc.? Would it require other fertilizer afterward to get best results?*

Five hundred pounds of lime per acre, during the growing season, properly distributed and cultivated in would be safe, and other applications of the same amount may be made annually as conditions seem to require. It is better to make application during the early part of the rainy season. The use of other fertilizers would be desirable later, either to stimulate wood growth or to promote fruit-bearing as the trees seem to require. Lime is not a substitute for other fertilizers. One of its chief purposes in California is in rendering the soil more fit for active root action and thus promote assimilation of other plant food by the plants or trees which may be put upon it. We suppose you have demonstrated that the land has become sour. It is not usual for light land, unless it has been too wet for a considerable period.

### Liming Orchard Soil.

*Should lime be applied to improve the texture of adobe soil of a prune orchard? After plowing or before? In the spring or fall? How much lime to the acre? Is ground lime rock better than lime for this purpose? The orchard will be irrigated as soon as the prunes are all picked. What other method of improving this kind of soil do you recommend?*

If you do not mind wheeling or tramping over the plowed ground you can spread after plowing and avoid burning your horses' feet and your own shoe leather. It is easier to spread before plowing, and in that case do it some time before, so the rain may slake and carry much of it into the ground—that is, do not lime and plow immediately. Liming should be done early in the rainy season, or you can spread

lime in advance of your irrigation after fruit picking. Caustic lime acts on texture more quickly and effectively than ground limestone. Other ways to improve texture are to use stable manure and grow cover crops—also to watch and work the soil when it crumbles best. You can use 500 pounds of lime per acre and keep doing it for two or three years.

### Supplementing Stable Manure.

*What is the best commercial fertilizer for light, sandy soil? I have not enough manure to cover all the ground this fall.*

Theoretically at least, the best way to use a limited amount of stable manure is to spread it more thinly and use with it a complete commercial fertilizer, which approximates its composition. Good practice is to grow a cover crop with fall and winter rainfall and to apply the fertilizer to push the growth of the cover crop, or to scatter the commercial fertilizer on the cover crop and plow the two in together. Nitrate of soda is also used to stretch out stable manure, but it should be applied toward the end of the rainy season usually, although of course it may be used to push a winter growing crop. On land not covered with plants to use it, nitrate should not be used while there is too much water moving to carry it away.

### Nitrate in Tree Planting.

*We are setting a young orchard on land rich in phosphoric acid and potash, but lacking in humus and nitrogen. We wish the trees to make a good start. Will nitrate of potash (of which we happen to have a supply on hand) give the desired effect? How much should we use per tree?*

If you are sure that your soil is too poor to grow a young tree, which is not often true, it is rational enough to use nitrate, and nitrate of potash is better than nitrate of soda. It is dangerous to put nitrate in the hole with the tree because of the chance of its not being mixed with enough earth. You might safely mix a small handful in the loosened earth in the bottom of the hole, then fill and pack around the roots with fine earth without nitrate and scatter a little more nitrate on the earth which you are to use in finishing the fill. If you wish to take all that trouble you could safely use a quarter of a pound to the tree. It would, however, be altogether better to plant without nitrate and then if, when it has water and cultivation enough, the tree does not grow to suit you, make a surface scattering of half a pound of nitrate to the tree and let it go in with irrigation water and following cultivation.

### Dissolved Nitrate for Flowers.

*In applying nitrate of soda to flowers, can I dissolve it in water; some say it will burn the plant?*

Nitrate is largely used by florists at the rate of one teaspoonful to three gallons of water. If scattered over the surface, before rain

or sprinkling one ounce to one square yard of surface may be used. If used too often, it may kill the plants or cause overgrowth. Watch the plants; their appearance will indicate when to use the pushing fertilizer.

### Nitrate on Citrus Trees.

*When is the best time to apply nitrate of soda on citrus orchards? I hear it would hurt blossoms if applied at that time.*

Nearly all authorities and citrus growers of much experience agree that the best time to apply nitrate of soda is early in the spring. Nitrogen in that form is particularly desirable for application at that time because of its availability. With other forms of nitrogen, such as blood, it is absolutely necessary that the soil be very warm when the application is made in order that best results be obtained, but with nitrate of soda, or nitrate of lime, or sulphate of ammonia, the nitrogen is supposed to be in a form that the plant can immediately take up. I have never heard of any danger of weakening of blossoms by applying in the spring and should think that the tendency would be just the opposite, as anything that would tend to make a strong, vigorous condition should tend toward setting a better crop.—C. C. Teague.

### Fertilizing Grape Vines.

*I intend to use a little commercial fertilizer for my young grape vines—1, 2 and 3 years old. I would put a little near each vine and cover it up several inches deep. How much would you put on each vine to stimulate growth?*

About two pounds of commercial fertilizer per vine is a good amount. It should not be put too close to the trunk. Better if none came nearer than a foot. Whenever the trees, vines or other crops do not come up to expectation fertilization probably will be profitable. Whenever vegetation flourishes vigorously fertilization is probably not necessary. When in doubt use some, as most are inclined to overestimate the thrift of their trees. A good mixture is 4 per cent nitrogen, about 1 per cent being from nitrate and 3 per cent organic, 2 per cent potash, and 8 per cent phosphoric acid. This combination is a good one for growth.

### When to Apply Fertilizer.

*I have some soluble complete fertilizer over after fertilizing my orchard, and as I intend planting some corn and potatoes next spring, I would like to know when to apply it.*

Apply the fertilizer when preparing the ground for planting in spring. For trees and vines a fall application might be better with most fertilizers and in fact might be well with you if only potash and phosphoric acid were present. With so much soluble nitrogen and the crop you intend to fertilize not planted yet, you can wait.

### Gypsum as a Fertilizer Absorbent.

*Does the action of gypsum reduce the fly pest and preserve the manure from loss of volatile matter?*

Unless properly handled fermentation rapidly sets in in manure and volatile contents pass off into the air, which can be detected by the odor of ammonia. By using finely ground gypsum or land plaster the escape of ammonia can be somewhat lessened. This is the chief reason for using gypsum as an absorbent, although it materially aids in solving the fly question. Many dairymen use from one-half to a pound of gypsum per 1,000 pounds of animals in their milking barns, scattering it on the floor after the barn has been cleaned. They do this to keep flies down as well as foul odors.

### Corn Stalks for Fertilizer.

*Can I work in corn stalks profitably as an orchard fertilizer? Can the stalks be spread, a disk run over the same and then plow them in in the spring, or would it be feasible to rent a gasoline corn stalk chopper and cut them up?*

If you are dealing with a light soil, the plowing in of the stalks will give you more trouble than could be compensated for by the humus which they might ultimately produce. On a heavier soil they can be hashed up and plowed in as you propose. It is doubtful if their value would warrant even hiring machinery for the purpose. A better proposition would be to trade them to some local cow feeder in return for as many loads of manure as he is willing to give you.

### Leaf Mold and Oak-Root Fungus.

*We have been gathering leaf mold from an oak grove and placing the same (mixed with droppings from cattle pastured in the grove) around our young orange trees to provide humus fertilizer and put the heavy soil in good mechanical condition. The results have been fine. Would it be possible to infect the orchard with "oak-root fungus" providing it were present in the oak grove?*

One can hardly say it is impossible, but it is so improbable that we would not hesitate a moment to continue your practice because of fear of it.

### Plowing-in Tomato Vines.

*We had between our young oranges tomatoes. Of what value as a fertilizer would the frozen vines be? Would it pay to plow them under? Unless it would, we would not plow the orchard this year.*

You should surely plow them under for humus; besides, do not let the land go unplowed this year.

### Highest Value in a Vetch.

*In all my reading regarding the value of vetch as nitrogenous fertilizer, I haven't as yet seen a statement as to when is the time to plow under to get the greatest results, regardless of any conditions.*

If you mean when the plant has highest value in itself it is while the pods are still green and the stem yellowing a little at the base.

### Nettles as a Cover Crop.

*How could I get rid of nettles that persist in coming up thick every winter in my orchard and fairly smother out the cover crop, notwithstanding the orchard is irrigated and kept quite clean through the summer?*

Make a cover crop of the nettles. Run a mower over them as soon as they get about a foot and a half high; let them make a second growth and then plow all the stuff under in February or early March. In this way you can keep the growth from getting too stemy and hard to handle with the plow. Nettles are all right for humus. If your irrigation water brings in the seed you are likely to be in the nettle business right along unless you get the ditch company to clean their ditch banks. If the seed does not come in the water your summer and winter tillage will soon clean them out.

### Lupins and Bacteria.

*Is growth of small lupins on land an indication of sufficient nitrogen-gathering bacteria being present for alfalfa?*

Presumably, yes. You can tell whether bacteria are operating by taking up a young plant carefully and see if there are nodules on the roots. Presumably also the presence of germs on lupins, bur clover and other wild legumes equips the soil for alfalfa, beans, etc., or we would not get the crops we do by planting without inoculation.

### Nitrogen Bacteria and Bur Clover.

*Will the nitrogen-producing bacilli of the bur clover live and work on alfalfa? Would a soil solution containing tubercular roots of bur clover be a satisfactory means of "inoculating" alfalfa seed?*

It is believed that the reason alfalfa succeeds so generally in California is that the widespread bur clover has loaded the soil with the proper bacteria. The earlier view that different legumes required different bacteria for each of them is losing force in the face of recent investigations. Whether you need to use bur clover soil solution is doubtful. It is probable that the bacteria are already installed in most California soils.

### Sweet Pea Straw.

*What is the best way of using sweet pea straw for fertilizer? What crop would best follow sweet peas? How can the green aphis be prevented from damaging a crop of sweet peas?*

When thoroughly dry, as it comes from gathering a seed crop, the straw can be spread, disked to break it up, and plowed into a heavy soil as soon as there is rain enough to deeply wet the soil.

The straw can be spread in the corral, trampled fine by the stock, and spread with other corral cleanings at the beginning of the rainy season. It may also be piled, wet down and reduced by composting with farm manure. This will make a rich manure for garden use. Sweet peas improve the land for any crop which it is profitable to grow in the locality; so far as we know, everything from grain to vegetables is better when following them. Pea aphis must be killed with a tobacco spray as soon as they appear. They are hard to handle if allowed to get headway. Therefore, the young plants must be closely watched and spraying done as soon as the pest is discovered.

### Fertilizing With Alfalfa.

*Will a six-foot strip of alfalfa in the center of the rows one way furnish sufficient fertilizer in an apricot orchard? I would let it grow continuously. We have no water in August and September, but plenty in the spring.*

Alfalfa does not add all forms of plant food to the soil. Some substances it takes from the soil; and though its growth processes may render them more easily available to other plants, the most it can do in that line does not actually add more of these substances to the soil. If then the alfalfa is grown as a crop and sold away from the land in the form of hay, the supply of these substances is constantly being reduced by growing alfalfa in this way. But alfalfa and other legumes do add nitrogen by their ability to take it from the air through the action of bacteria on their roots. For this reason you cannot count upon alfalfa as restoring to the soil all the plant food which the apricot tree takes from it in its wood growth and fruit crop. All except nitrogen must be made good by other means of fertilization. If alfalfa is grown without cutting, or is cut and the cuttings allowed to remain and decay, the plant will, theoretically, not take anything off the land, but, at the same time, it adds nothing but nitrogen to it. If the soil is naturally richly supplied with all other plant foods, then the addition of nitrogen, by alfalfa growing or otherwise, is a rational proceeding. If only a small addition is needed to the natural supply of nitrogen, then a narrow strip of alfalfa may be enough, but this is probably not often the case.

A more important consideration for you is whether you have soil-moisture enough to grow the strip, supply the waste by evaporation and meet the needs of the trees. You have no water in the autumn, and the probability is that the alfalfa will rob the trees during that period, weaken the next year's fruit buds and perhaps cause dieback of branches if not the death of the trees in extreme cases. Rational enrichment of the soil consists in growing a legume when there is naturally more water in the soil than the tree can use, or when the soil can be kept adequately moist by irrigation. Therefore a winter-growing legume, and not alfalfa, is indicated in your case. However, if you can grow enough alfalfa hay on that strip to spread as a mulch over all the rest of the ground between the trees and thus substitute a mulch for summer cultivation, you may save enough

moisture by checking evaporation to more than compensate for that which the alfalfa uses in its growth. This is the latest problem in the summer handling of California fruit lands which is now awaiting demonstration.

### Dry Vegetation Makes Humus.

*Do the dry leaves of vetch that have fallen in the stubble contain the same fertilizing properties if plowed under as a like number of green leaves?*

They contain the same fertilizing properties. Whether they would contain as much (allowing for water in green tissue) might be a question to be determined by analysis, but they are all right in quality. This is practically shown by the fertilizing effect demonstrated to belong to alfalfa hay and by the mold formation by dry leaves of forest trees, etc.

### How to Find the Best Cover Crop.

*What would be the best cover crop to plant in a prune orchard in Sutter County? Both rye and clover have been recommended.*

The best cover crop is the one you are sure to get most growth of before the spring date at which you have to plow it under. Any legume (clover, vetch, etc.) is better than rye, theoretically, because of its greater content of nitrogen and its ability to get nitrogen from the air, but you are not sure if a legume will make enough winter growth until you try it. You are sure of rye. Therefore, sow rye largely and several legumes (field peas, vetch, bur clover) in small areas so you will know next year whether you can depend upon any of them for the free winter growth which you need. If you prove out such a one as satisfactory, sow that forever afterwards.

# PART V. LIVE STOCK AND DAIRY

### Controlling Sex of Animals.

*I have read from what I supposed to be good authority that if a female gives birth to a male and becomes pregnant at the next "monthly period" it will be a female, and that this holds good for every odd number. The even periods will give a male. If the birth is female, the opposite holds good, the odd periods then giving a male, while the even periods will give a female.*

Many theories have been advanced, and while many have never been disproved, none have ever been recognized as absolutely reliable by authorities. M. W. Harper, in his "Breeding of Horses," makes the following points: "Data gathered from various sources seem to indicate that the two sexes are produced in practically equal numbers. The relative number of males per 100 females is given for horses as 99, for cattle 94, for sheep 102, for swine 104, and for poultry 95. In Europe a study involving 60,000,000 human births showed an average of 106 males to every 100 females. A few of the more common external theories that have gained popular credence, but which, so far as present knowledge goes, contain no basis in truth will be reviewed. It is stated that the sex is determined by the degree of maturity of the egg cell at the time of service. If the service takes place early in the period of estrum or heat, the offspring will be a male; if later, a female will result. This theory is disproved by the results of ordinary farm practice. When males and females run together, the service always takes place during the early stages of the period, which should make the offspring practically all of one sex, yet the proportion of males and females is approximately equal. It is said that the ova are alternately male and female, and that the sex of the offspring can be controlled by the choice of the proper estrum or service. Thus, if the last young was a male, then mating at the first estrum as well as third, fifth and so on, would produce females, whereas the second, fourth, sixth, and so on periods would result in males. This theory is disproved by the results of farm practice, especially in horse breeding, where males follow males and females follow females without the alternating period of estrum, it being the custom to breed mares on the ninth day after foaling."

### Breeding Young Mares.

*What will the effect be if I breed my young mares at two years old? Will it affect growth or disposition?*

Some breeders contend that early breeding of mares has a tendency to increase the fertility and advance the development of the mare. Also

that the chances of colts from mares bred at this age are as good as the first foals from older mares. Other breeders, however, contend that early breeding has a tendency to lessen the vigor of the mare, retard her development, and handicap development of the foal because the dam is immature. It is also claimed that two-year-olds fail to catch well. M. W. Harper, in "Management and Breeding of Horses," says: "From experience it seems that the practicability of breeding a two-year filly depends on at least three factors: The breed, the individuality of the mare, and the object sought. As a rule, horses of the heavy type mature younger than those of the light type. A draft filly at two years of age is often as mature as a trotting, running or saddle filly at three years of age. Individual mares differ in the way they mature, as a smoothly turned, neat, and well-finished one develops much younger than a rough, coarse and growthy individual. Maturity is influenced by the feed and care. A filly that is kept growing continuously from birth will mature earlier than one imperfectly cared for and which receives a setback each winter. If breeding pure-bred animals, and the object is to improve the strain, the advisability of breeding a two-year filly would be questionable. On the other hand, in working with grades and the object is to produce draft horses for the market there is no reason why fillies cannot be bred at two years if they are grown and mature, and their owner is willing to feed and care for them properly during pregnancy."

### Best Season for Foaling.

*Is there any serious objection in breeding a mare to foal in midsummer? It is pretty warm here in summer. I have only to mow and haul hay in summer and can get plenty of neighbors to help me at that, but in the fall and spring I have the heavy work of plowing, planting, etc., when the weather is favorable and the neighbors' horses are not available.*

Summer colts in hot valleys are believed not to do as well as either spring or fall foals. The heat and flies seem to retard growth, but aside from that there is no reason we know of for not breeding in August. If your fall work does not start till after the fall rains it would be preferable to breed for fall foaling, say in October. If heavy work commenced in December the colt would be old enough to permit of working the mare if you provided some feed for the colt. Fall foaling is not considered so desirable as spring foaling as there is very apt to be a lack of exercise provided for the colts in winter.

### Stallion License Fees.

*What do we have to pay for a license on a stallion, and also is there anything else to pay?*

If your horse has not been previously licensed for public service, the cost will be $2.50. A renewal of his license will cost $1.00. To secure a license certificate, you forward an affidavit signed by a licensed veterinarian to the effect that he has personally examined your stallion

and that to the best of his knowledge and belief, the stallion is free from hereditary, infectious, contagious, or transmissible disease or unsoundness. You must also furnish the Stallion Registration Board stub book certificate of registration of the pedigree, provided the stallion is registered, and all other necessary papers relative to his breeding and ownership. Send these to the Secretary of the Stallion Registration Board, State Capitol, Sacramento, together with your remittance of $2.50 or $1.00 as the case may be.

### Inbreeding Inadvisable.

*What is your opinion of breeding a mare to a horse that is half brother to her? Are they too closely related to expect a good colt?*

Unless there is some very good reason for inbreeding in this way, such as inability to get mare to another horse, or exceptionally good individuality on the part of both mare and stallion, I should consider it a mistake.

### Polo Ponies.

*What breed is used mostly for polo ponies? What do you think of raising horses for such uses and is there any demand?*

The increasing popularity of polo is attracting much attention to ponies suitable for playing this game. The polo pony is really not a pony, but a small horse. He does not necessarily belong to any distinct breed, and is generally a cross. For this purpose any horse possessing the necessary speed, endurance, and intelligence will do. He must be able to carry 160 to 200 pounds weight, make incessant turns, twists and stops from full speed, and make short spurts at the rapid gallop. The maximum height allowed by the American Polo Association is 14.2 hands. Small thoroughbreds, Western ponies, and cross breeds are popular. Breeding polo ponies, however, is somewhat of an experiment and presents many difficulties, the chief being the limit of height and the training. We cannot advise you as to the outlook for such breeding.

### Loading Horses on Cars.

*Is it best to place horses in a stock car for shipment with heads all one way or alternating? Should the shoes be taken off?*

If you have a carload of about eighteen, drive them in loose, if less than a carload, tie them. It does not matter which way they face. It is best to take off the hind shoes.

### Catching up Registration.

*I have a number of pure-bred Jersey cows, all bred from registered stock, but registering discontinued some years ago. The bulls that have been used are all registered, but it would be necessary to go a long way back on some of the cows. Can such cows be registered?*

To register your cows at the present time you will have to have each cow registered, from the last registered one down to the cow of today.

Not only that, but each bull must be registered, that the pedigree can show the name and number of each animal there is, back to registered stock, or even back to the Jersey Island, to foundation stock. You had better take the matter up directly with American Jersey Cattle Club, 324 W. 23rd St., New York, N. Y.

### Hogs and Dairy Cows on Twenty Acres.

*I have 20 acres of land and have planned to put in about 10 acres of alfalfa and about 7 acres of corn, cow peas, or other grain feeds from which I can get two crops a year. I want to keep cows and enough sows to raise pigs to use the balance of the feed. I will have plenty of water for irrigating. Would it pay to build a silo and how would that feed do for hogs? Would it be more profitable to pasture the hogs or keep them up and cut the alfalfa?*

The plan you outline is becoming popular among small dairymen. You can plant a wide variety of early maturing crops which will work in well with corn for a silage crop. The ones most generally in use are barley, oats, rye or vetch. Barley ripens earlier for hay, allowing earlier corn planting. The average yield of silage corn is about 10 tons to the acre, and a silo 12 feet in diameter and 32 feet high, holding 72 tons, would be about right. Experience has shown that silage can not be profitably fed to swine, as they only eat the grain part, the balance being practically all wasted. The number of hogs that you keep depends upon the number of cows you intend keeping. It is generally claimed that one cow and three hogs can be maintained a year on an acre of good alfalfa, where the hogs receive the skim milk from the dairy. The average brood sow will raise about six pigs to the litter and can raise two litters a year. You would secure better results by cutting the alfalfa than by pasturing, unless you reserve a small pasture for the hogs to run on.

### A Squeezer for Branding.

*How do you make a "squeezer" for branding cattle?*

Build the left side by setting three posts firmly in the ground and boarding the inside, the first two feet solid, and six-inch space above, using 2x6 lumber. Leave space at left hip of animal for putting on the branding irons or any other work you want to do. The "right"side is built similar except setting posts in ground. They should be securely hinged at bottom of squeezer to allow opening and closing of squeezer lever. The lever is attached to left side of squeezer to which is attached a rope running through the middle post on pulley wheel to tie to middle post on right side. This lever acts to hold animal in position while being branded, and should be eight to ten feet long. The squeezer should be built at end of a long chute and the longer it is, the more rapid the work, so would be well to be forty to sixty feet long, especially if a large band of cattle is handled. Dimensions of squeezer: nine feet long, six to seven feet high, and ten inches wide at the bottom. Dimensions of chute: forty to sixty feet long, six to

seven feet high, fourteen inches wide at bottom and thirty inches wide at top. A gate should be built secure and independent at other end of squeezer.—Paul Parker, Salinas.

### To Prevent Self-Sucking.

*Will you give me a plan of preventing cows from sucking themselves?*

Fit a girth around her body, close to her shoulders, having a ring suspended under her belly. Take a strong but light stick and fasten a snap onto each end. Snap one end of this stick into the ring on the girth and run the stick through her forelegs, snapping the other end into the halter ring. In this way she will have freedom of the head to eat, etc., but cannot get to the udder. More head freedom is given by the two-slat affair described in Part V, Vol. I.

### Dehorning Heifers.

*I have some heifers, coming two years old, which I wish to dehorn but have been told that if dehorned before third year, stubs will grow. Is it advisable to wait? What instrument is best?*

There is no need to wait to dehorn your heifers. A butcher's meat saw is as good an instrument as you can get. Be sure and make your cut close to the skin of the head in order to destroy the horn forming structures at the base of the horn. Have a hot iron handy to stop hemorrhage. Apply Stockholm tar to the horn stubs. (For dehorning calves see Part VII, Vol. I.)

### Dehorning Cows in Summer.

*Would it do any harm to dehorn cows in summer?*

It would not do the cows any particular harm, but dehorning is not generally done during the summer on account of the flies which are attracted and which greatly annoy the cow. The usual time for dehorning is in the spring, before the fly season starts.

### Butchers' "Weighing Condition".

*I sold two 250-pound calves to our butcher and the weight he returned was about 60 pounds less than they weighed here. As they rode only 3½ miles, and that in a spring wagon, I knew they could not have lost $4 worth of weight in that distance, so I asked about it. He said it was not fair to him to get them full of grass, and that they should be "gaunted." He said that when cattle and hogs are sent to the San Francisco market they are not fed or watered the night before they arrive or the day they are weighed, so that when weighed they are entirely empty. Is that correct and the accepted custom?*

It is the practice of all buyers to hold cattle about 24 hours before they are weighed, without feed or water, although we doubt whether it

is a common practice with country butchers. If this were not done, the sellers would very often fill the stock up with water and feed during the last 24 hours, with a resultant loss to the buyer when butchered.

### Increasing Milk Yield.

*Is there anything to increase supply of milk in cows? Do some cows quit having calves after having two? If this is so, is there a cure in a young four-year-old?*

If a cow is below her normal yield, or the milk yield for which she has natural capacity, and is in good health, her yield can be increased by better feeding with foods rich in protein—as alfalfa is, for instance. Some cows quit having calves at various ages and for various reasons; so far as we know there is no prevalence of the two-calf limit. There are so many things involved in the sterility of animals that consideration of the individual case by a qualified veterinarian is necessary.

### Selling Dehorned Bulls.

*If I have my young registered bull dehorned will he be as readily salable as he would be with horns?*

It would depend upon the customer and for what he might want the bull; for use alone or possibly for exhibition also. Probably most buyers would prefer the natural form of the animal.

### Spaying Scrubs.

*Does spaying cattle set them back much? When should it be done, as calves or yearlings? Isn't it a common practice in the East? I have been told that it stunted a calf to spay it. It seems to me with a bunch of mixed cattle, if one spays his scrubs, he will be able to breed up much faster.*

Spaying has just the opposite effect. The animals make much better gains and better beef. Spaying has been a common practice, but the high price of beef has stopped it, as every cow that would bring a calf has been in great demand. The best time to do spaying is when the weather is cool and the flies are scarce. When properly done, all effects of the operation will disappear within two weeks. The best age to spay is at one year. The use of a good pure-bred bull and selection will, however, produce remarkable results in the course of a few years and you can breed out your common stock that way.

### Changing from Summer to Winter Milking.

*I have cows which came fresh last March and April. Is it best to breed them this summer or wait until December, which will bring them fresh again a year from next fall, when butter fat is on the rise in price? It seems a long time to let cows wait, and I wonder if it will not make the cows dry for too long a period to be profitable. If they are bred*

*now, however, they will come fresh in the summer, when butter fat is low and the heat lowers their production.*

You would probably find it more profitable to change the freshening time of your cows more gradually, having them come fresh a month or two later each year. By making the change all at once, you may have trouble in getting the cows with calf after the long wait, besides having them dry, or nearly so, for a long time.

### Holsteins and Color.

*How should a thoroughbred Holstein bull be marked; if more white than black, and how should his calves be marked if the mother is not a thoroughbred? I recently bought some Holstein cows, but they are mostly black, are good milkers and large cows, but are not marked with much white.*

There is no particular way in which a pure-bred Holstein bull should be marked. In recent years there has been a tendency among some breeders to favor animals with more white than black but this is simply a fancy and has nothing whatever to do with the quality of the stock. When a pure-bred bull is used on grade cows, the calves usually show considerable white, providing their sire also carried considerable white. The cows you bought may both be pure-bred Holsteins, whether they be marked with much white or not.

### Heifer Twins Are All Right.

*I have a fine heifer that was born a twin, and people tell me that she will not breed.*

If your heifer was born a twin to a bull calf she is probably a "free martin" and will not breed. If her twin was a heifer, she will probably be normal and breed.

### Breeding Twin Sheep.

*If a ewe has twin lambs, one a ram and the other a ewe, will the ewe be sterile the same as in a similar case with calves? If I save my ewe twins, will I be able to develop in time a breed of sheep that will always be twins?*

You need have no fear of twin lambs not breeding, although there are, of course, both ewes and rams which are sterile, the same as with all other kinds of live stock. This is not due to their being twins, however. As for developing the twin habit, presumably you could make some headway if you could work at it about 100 years.

### Breeding Young Sows.

*How old should a sow be before she is bred?*

Sows should not be bred to farrow until they are at least twelve months old and many breeders contend that it is better to have them

farrow at fourteen to sixteen months. This means that they should be bred at eight to twelve months, for the period of gestation is approximately four months.

### What a Good Cow Should Do.

*How many pounds of butter fat per year should one expect from a first class dairy cow well cared for? What should be paid for such cows at the present time?*

What one should expect from a cow in a year depends upon the man. Some dairymen are satisfied with a 150-pound cow, while others do not keep one that gives less than 300 pounds a year. It costs about $50 a year to feed and care for a cow under California conditions, where alfalfa is the main feed, so with fat at an average of 30 cents a pound a cow that gives 150 pounds of fat just about pays for her keep and no more. There are many cows that do not give more than that amount that are sold for from $50 up according to how bad a buy the purchaser makes, and it is hard to say what the average price is at this or any other time. You should be able to purchase good grade cows with a production of from 200 to 300 pounds of fat for from $80 up. The best way to get a herd of high producing grades is to buy the best cows that you can get and breed up with a pure-bred bull which has reasonably good milk records back of him, as most of those who have good grades in this State at present do not want to part with them.

### Which Cow Shall He Buy?

*I am going to keep four or five cows, sell cream and butter to customers in town, and feed the skim milk to chickens and pigs. Which breed would be better for me to keep—Jersey or Holstein? From what I can glean by reading the Jersey gives not so much milk but richer milk, while the Holstein gives more milk but not so rich, but in the aggregate yields just as much cream and more skim milk.*

You have the relative qualifications about right for the two breeds as a whole, but you still have to decide which qualification is best for you, considering your feed supply, land available, etc. Every man has to work that out for himself, and whichever breed he chooses he is pretty sure to permanently swear by. We would no more tell a man which cow to buy than to advise him which girl to marry. If he chooses for himself he will usually be content; if another chooses for him he will begin to doubt right away. It is that way with a man.

### Cows Before Calving.

*I have a two-year-old heifer, due to calve in about a month, which I notice when lying down would often squeeze quite a little milk from her udder. On trying to milk her I was quite surprised to get five pints of milk. Should I milk her regularly, how often, and up to how near calving time?*

It is poor policy to milk cows just before calving, as the first milk, colostrum, secreted is necessary to calf to start his gastric organs working properly. As long as your animal has good pasture, do not feed extra feed until after calving. If bag shows signs of hardening or caking, massage thoroughly and apply spirits of camphor rubbed in thoroughly. A large swollen udder is normal and needs no treatment.

### Dry Cows Before Calving.

*I have a young Jersey cow due to have her second calf in two months. Shall I milk her up to the time she calves, or dry her up about three weeks before her time? She is very nervous at times when milking, continually stepping, especially when milking the left front and right front teats. Her bag is not caked; in fact, she is perfectly sound in every respect.*

Dry your cow up two or three weeks before she calves. Her nervousness is due to her condition.

### How to Dry a Cow.

*What is the proper way to dry a cow?*

Do not milk out fully, but leave a small quantity of milk in the udder, gradually decrease the amount of milk taken at each milking, until finally a day or two may be skipped between milking. Always be on the watch for a hardening of the udder, which means that not enough milk has been taken out.

### Drying a Cow.

*Some people told me that it is better to milk a cow until the last day before she is fresh, and some say to dry her up four or five weeks.*

It is certainly advisable to dry up a cow for a time before freshening. A month or six weeks is about the proper period of rest. Some cows, of course, refuse to dry and then one has to make the best of it. Cows of beef or dual purpose breeds that have no natural tendency toward heavy milking, will of their own accord wish to dry early, it is often advisable to keep them milking strong as long as possible, but a cow of a straight dairy breed will not be injured but helped by being dry a few weeks before calving.

### Arrangements With Dairy Tenants.

*I am arranging to lease an alfalfa ranch on shares and am furnishing my tenant with dairy stock, buildings, and the necessary cans, separators, etc. Tenant is to do all work on the place, furnishing his own wagons, horses and agricultural implements. We expect to divide the cream check half and half, but are uncertain as to the customary division of the increase.*

There are no hard and fast rules in such cases. In a general way, if you stock the ranch to its capacity, the tenant should raise to weaning

age 10 per cent of the calves, which would keep up the stock in future years. These we believe should be taken care of after weaning by yourself, as it is to your interest that the producing power of the herd be kept up. All other calves would go to the tenant with the understanding that they were not to be kept on the ranch after weaning, as that would lower the cream checks through a smaller amount of feed for the milch cows. The same provision should be made with hogs, if any are raised by the tenant; that is, he should not be allowed to run them on pasture or feed from feed grown on the ranch which could otherwise be turned into butter fat through the cows. A provision should also be made which would specify the number of horses which are to be kept by the tenant for the same reasons as above given.

### Money to Buy Cows.

*I have heard that there are creameries which furnish the ranchers with cows and take half of the cream check each month in payment for them.*

Creameries do sometimes arrange to get money for farmers for buying cows by endorsing for them. The money comes from a local bank on a farmer's note, usually secured by a chattel mortgage on the cows, payments to be made monthly on said note—usually 50 per cent of the cream check due for cream sold to the creamery. The amount loaned per cow is usually about $30 to $35 at 8 per cent, or more, interest. Such notes are endorsed by the creamery. These terms are sometimes varied slightly according to the financial standing of the borrower, grade of cows and needs of dairymen for money at certain times for harvesting crops, etc. The borrower must, of course, be a patron of the creamery from whom the loan is secured and must so continue until all amounts due are paid.

### Pasteurizing Milk Law.

*Does a law go into effect in* 1916, *compelling all retailers of milk to install pasteurizing outfits, and just what is the law?*

The law you refer to goes into effect October 1, 1916. It provides that all milk and cream sold as market milk, or to be used in the production of dairy products, other than cheese, must either come from cows that have successfully passed the tuberculin test, or it must be pasteurized. It provides that pasteurization shall consist of heating the milk to not less than 140 degrees F. and holding it at that temperature not less than 25 minutes. The milk must then be immediately cooled to 50 degrees F., or lower. Cream used in the production of pasteurized butter must be heated and held for 25 minutes at 140 degrees F., but it need not be cooled to a lower temperature than is desirable for the ripening of the cream. All pasteurizers must be equipped with recording thermometers which will accurately record the temperature to which the product is heated and the time it has been held at such temperatures. The daily records

made by the thermometers must be preserved and kept on file two months, and kept open for inspection by representatives of the State Dairy Bureau or any State or city health officer.

Another amendment to the former laws regulating retailers of milk, provides that any person or company labeling or representing milk to be pasteurized must use the same method of pasteurization and cooling. This became a law August 4, 1915.

It is commonly thought that the first mentioned law will not affect the dairymen selling butter fat to the creamery, or whole milk or sweet cream to retail delivery companies, the presumption being that the pasteurizing will be done by such concerns themselves. The small dairyman who retails his own product will either have to keep cows free of tuberculosis or install a pasteurizing and cooling plant.

### Oil Stove in Milk Room.

*Can an oil stove be kept in milk house for heating water to wash milk utensils, if milk or cream are kept in the same room, without tainting the cream or milk?*

It would be much better to have oil stove and washing utensils in a separate room from where milk and cream are kept, as there are few oil stoves that do not give off some odor. Such room need not be expensive, a lean-to shed being suitable in case you do not desire to build a better structure.

### Milk Cooler.

*What is a "milk cooler"?*

A milk cooler is used for the purpose of reducing the temperature of either milk or cream. They are sometimes made in conical shape and sometimes in riffle shape, the object being to run the warm milk over a water and air cooled surface. By running a thin sheet of milk over these riffles, the air itself lowers the temperature somewhat, but to further cool it, the utensil is so made that a continual stream of water is run inside the vessel, thus reducing the temperature of the milk to about 50 or 60 degrees F., if freshly pumped water is used. Where whole milk is to be sold, it should be poured over the cooler as soon as possible after being milked, but if butter fat is sold to the creamery, it is better to cool the cream alone as it runs from the separator into the cream can.

### Acid and Heat in Milk Testing.

*Which is the best kind of sulphuric acid to use for milk testing? If the hot water that is put in the bottle is not hot enough, does one get as good a test?*

Sulphuric acid for milk testing should have a specific gravity of 1.825, should be almost as clear as water and should not contain any foreign matter. The water for testing milk should be nearly boil-

ing when the testing is started and it is much better if the tester is kept hot by steam pipes, while the testing is being done. This applies particularly to cream testing.

### Horsepower and Pasteurizing.

*What size boiler (h. p.) would be required to operate a single bottle washer and sterilizer which sterilizes 24 gallons at one time—not over 250 bottles washed at a time? What h. p. boiler would be required for a pasteurizer of 40 or 50 gallons capacity? Does pasteurized milk need cooling?*

A one and a half horsepower vertical boiler would be large enough to run your bottle washer and sterilizer, but it would be more economical in operation to have a two h. p. boiler of the same type. To furnish power for bottle washer, sterilizer and pasteurizer of 40 or 50-gallon capacity, you should have nothing less than a four h. p. vertical boiler. Perhaps the most serious question confronting the whole-milk dairymen with small herds is not so much the pasteurizing as it is the proper cooling of milk after pasteurizing. To keep milk any length of time after it has been held at a temperature of 140 degrees in the pasteurizer, it should be immediately cooled to about 40 degrees F. This is best accomplished by a supply of brine or ice water through which the milk is run. In case you do not have the facilities for doing this, you can build a refrigerator in which the temperature is kept down by the use of ice, or pack your bottles after bottling, with ice.

### Bitter Butter.

*The last butter I made would not turn hard, although I churned for hours to see if it would, and was so bitter we could not eat it. The cream and milk is always good and sweet so I cannot imagine what the trouble may be.*

You must have intended to state that the cream would not churn, for no person would churn a long time after the butter came in order to harden it. Over-churning would have the effect of making it greasy and incorporating a lot of buttermilk. In farm butter-making there are often difficulties in churning, especially at times when most of the cows are dry, and when those still milking are well advanced in the period of lactation. The milk at that time contains a large proportion of small fat-globules that are not easily gathered. To ripen the cream to a higher degree of acidity, to obtain cream from cows that have freshened within a few months, or to feed the cows more succulent food will sometimes remedy the trouble. If the cream is not churned sweet and fresh it should be properly ripened as quickly as possible. If cream is left during cool weather until it gets sour, the lactic acid bacteria will develop so slowly that they will be crowded out and too many undesirable bacteria that produce bad flavors will develop. This may be the cause of the bitter flavor of the butter.—F. W. Andreasen, Sec'y State Dairy Bureau.

## Small Cheesemaking.

*Can one who is ignorant of the subject make and sell cheese as profitably from three or four cows on alfalfa as can be made from selling butter fat? What work on cheese making would you recommend?*

It takes an experienced cheese maker to make good cheese, and with cheese there is an added objection in our alfalfa sections due to the difficulty of making good cheese from alfalfa milk, which even experienced cheese makers often find difficult. Then too, in making cheese the cost of equipment, etc., for a three-cow dairy would be prohibitive. You had better stay with the butter fat proposition at least until you have a much larger dairy and master the details of cheese making. "Science and Practice of Cheese Making" is a complete treatise on the subject and may be obtained at this office for $1.75.

## Hints on Cream Testing.

*In testing cream with the ordinary four-bottle Babcock hand power tester we have difficulty in keeping the butter fat in the neck of the bottles from getting cold and solidifying during the last whirl of the bottles. This makes the test unreliable and very hard to read. We use a "full" sample of cream,* 18 *cubic centimeters and* 17.5 *cubic centimeters of sulphuric acid which we get from the creamery. The acid seems to be strong enough as it works very well in testing milk. I understand there is a way of testing cream by using a "half" sample or* 9 *c. c. and adding* 9 *c. c. of water. My test bottles are graduated up to* 50%. *I am getting a* 9 *cubic centimeter pipette but am not sure whether or not that I should use a* 9 *c. c. pipette with a* 50% *bottle.*

You cannot expect to get accurate results by measuring the cream either with an 18 cubic centimeter, or a 9 cubic centimeter pipette, because the weight of cream such a pipette delivers varies with the temperature, the richness of the cream and the amount of gas or air the cream may contain. To obtain accurate results the cream should be weighed, using either an 18-gram, or a 9-gram sample as you may prefer. A 9-gram sample may be placed in a bottle graduated for 18 grams, 9 cubic centimeters of water added, and the test run in precisely the same way as though 18 grams had been used. The only difference is that the reading must be multiplied by 2. There is nothing to be gained by using a 9-gram sample in a 50%-18-gram bottle. If you wish to use 9 grams instead of 18 grams you can purchase bottles graduated to give the percentage directly on 9 grams. In attempting to keep the fat from solidifying before reading, heat the cups of the tester by means of hot water before placing the test bottles in them; run the test in a warm room; make sure the water added during the testing is hot, and that you place the bottles in a warm bath at about 140 degrees after taking them from the machine. Some of your trouble is due to the fact that you may be using too much acid. A fixed amount of acid should not be used, but rather such an amount as will give you a good clear fat column. The amount that will give you this clear fat column can be judged by the color of the milk and acid just after they

have been thoroughly mixed together. This color has been described as being "similar to that of coffee after cream has been added."—C. F. Hoyt, Chemist State Dairy Bureau.

### Butter Fat in Cream.

*Is the same amount of butter fat contained in a given quantity of cream from different cows, the test in each case being the same?*

If cream has a certain test, it does not matter a particle what cows produced it, otherwise creameries by their testing would not know how much fat they were buying. A test of 35, for instance, means that in every 100 pounds of cream there are 35 pounds of fat, and 80 pounds of cream of that test would contain 28 pounds of fat, and so on without reference to the cows producing same. If you want to know whether different cows will produce cream of the same test, that is a thing for the separator to look after, and thick or thin cream can be secured by adjusting the separator accordingly. It is, of course, true that rich milk run through a separator will give richer cream than low testing milk run through the same separator at the same rate of speed without adjusting.

### What Kind of Cream to Sell.

*I have been told that one should have a cream separator set so that cream will test from 32 to 35 per cent and yet with separator adjusted in this manner I received an average of one-eighth pound of butter fat per day less from 25 pounds of milk than when adjusted to test 24 to 28. I cannot see why the higher test is better when I get more money from the lower test.*

In separating milk there should be no difference in the amount of fat in the milk, whether you were skimming 25 per cent cream or 45 per cent, as in either case you are supposed to get all of the fat in the milk, the only difference being that where 25 per cent is the standard, you are giving the creamery about 10 pounds more skim milk. It is for this reason that most dairymen set their separator to skim from 35 to 40 per cent cream, as anything above that is hard to handle and is more apt to cause a loss through being too thick. But it is very likely that some other thing is the cause of your decreased amount of fat. It may be that there is a difference in the temperature or you may have increased or decreased the speed of the separator which often times is the cause of much wasted fat.

### Types of Poland Chinas.

*Hog breeders who advertise in the Pacific Rural Press have for sale large and medium type Poland China hogs. In all of the stock books which I have referred to I find no mention of such types.*

Advertising in the above manner is due to the fact that two distinct types of Poland Chinas have been developed through years of selection on the part of the breeders some of whom admired the smaller

and more refined hog while others preferred the coarser and larger-boned one. By continual breeding for the smaller or medium-sized type, many breeders have wandered a long way from the original Poland China type, which was much heavier and coarser than even our present day large type. Both have their admirers; and it is simply a matter of which type you prefer. Guilford's "California Hog Book," published by the Pacific Rural Press, notes three types of Poland China: "big-bone, medium and fine-bone."

### Right Age for Breeding Sows.

*Can young sows be made to mate in a practical way?*

Gilts will usually take the boar at an early age, but it is the general belief that it is better to allow a gilt to get most of her growth before breeding so that she can do both herself and her pigs justice. This naturally varies with different animals as some mature earlier than others and can better withstand the drain on their constitution, but as a general thing the sow that is bred at one year old will likely prove more profitable than those bred younger.

### Registering Poland China Hogs.

*What is the cost of registering a pure-bred Poland China hog? What is the usual course of procedure between buyer and seller of pure-bred hogs? Can the seller make a price for registering* $5.00 *extra for each hog?*

In all the Poland China associations the fee for recording pedigrees is one dollar for non-stockholders and fifty cents for stockholders. The seller of a pure-bred hog gives a pedigree to the buyer and this pedigree is eligible to be recorded in either of the three companies, no matter upon which company's pedigree blanks it may be written. The seller can overcharge the buyer for having the pedigree recorded the same as he could overcharge the buyer for the value of the hog if the buyer will allow it. The buyer could demand the pedigree, and it is my opinion that the seller could be legally forced to furnish it, the same as he would have to deliver the hog to the buyer. But this is a legal point that could only be satisfactorily answered by one versed in the law. When the buyer gets the pedigree he could have it recorded as above stated.—Pres. A. M. Henry, California Swine Breeders' Association, Farmington.

### Cholera-Immune Hogs.

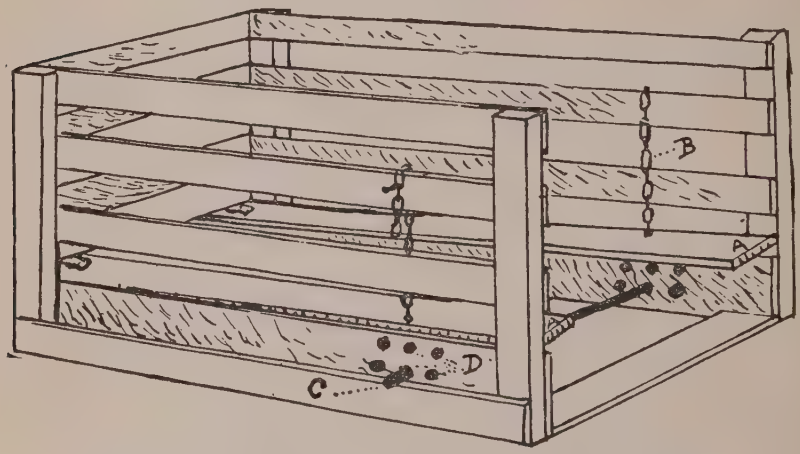
*There are advertisements of hogs in which some state their stock is cholera-immune. What is meant by "cholera-immune"?*

When advertisers state that their hogs are cholera-immune, they mean that their herds have been inoculated with cholera serum, and are considered immune from cholera. This, however, does not apply to their offspring, which will in turn have to be vaccinated the same as their parents before becoming immune.

## Hog-Breeding Crate.

*I have a large Poland China boar which the sows cannot hold up. Will you please give me directions for making a breeding crate?*

Make a crate 5½ or 6 feet in length, 2 feet 4 inches inside width and 3 feet high, out of 2x4 or other good strong lumber. Leave one end open and enclose the other end with a sliding gate. Lay a floor in the bottom with 1x10 boards. Nail 2x4 cleats on each side of the crate, from a point about where the sow's head comes in the front part of the crate to the floor of the crate at the other end. These cleats are for the boar's forward feet to rest upon and hold his weight off from the sow. Bore holes in the sides of the crate just above the point where




ADJUSTABLE BREEDING CRATE FOR SWINE.

the sow's hocks come, through which an adjustable rod may be run to keep the sow from backing out of the crate. In breeding the sow, back her into the front of the crate and close her in with the slip-gate. Drive the boar into the back end which is always open.

Another style of breeding crate is shown in the adjacent drawing, in which the measurements are as follows: Length, 5 feet 6 inches; width, 2 feet; height, 3 feet 6 inches. Uprights at corners are 2x4s; sides 1x4 strips with 10-inch boards at the bottom. Supports for feet of boar (AA) are hinged at front end of crate, and are raised by chains (B). Outside the crate are hooks to hold chains. "C" is an iron rod which slips through holes (D) in bottom side boards. It should come just above the sow's hocks. For a small boar on a large sow, place a cleated sloping platform at rear of crate.

### Farrowing Pens.

*For farrowing pens, would it do to build a house about* 20x72 *feet, with good floors and roof, divided into pens about* 6x8 *with a four-foot aisle down the middle? This would accommodate* 24 *sows. Even this for* 150 *sows would be expensive, but as they would not all farrow at the same time it probably would not be necessary to have more than four houses. The sows would not have to be shut up like this for more than six to eight weeks, when they could be turned out on the alfalfa.*

Prof. J. I. Thompson says the plan you suggest is quite a common one, though the pens should be 7x8, and for large sows 8x10, rather than 6x8. The sows would not necessarily be kept in these pens after the pigs are two weeks old. After that they could be allowed to run in pasture provided not too many are put together.

### Fall or Spring Pigs?

*Would boars from a spring litter be any better for sires than boars from fall litters, and if so, why?*

Chas. Goodman, of Williams, says that other things being equal, the date of farrowing would not affect the usefulness of the pig. If he is properly bred and properly developed that is about all that would be required to produce results. He would as soon have a boar farrowed on the first day of April as on Christmas if the breeding was all right but if the breeding was bad he would not take the pig at any price.

### Start With Scrubs, or Pure-breds?

*If a man has* $100 *to invest in hogs and needs a quick income, should he invest in pure-breds or in scrubs and then work into pure-breds?*

Your $100 will buy a lot of common pigs and you will keep them most any way, and if they are not too scrubby they will make you some money. The $100 will more than buy two choice pure-bred sows already bred to a boar whose ancestry guarantees the largest percentage of pigs which will have the most desirable market conformation, the greatest uniformity, the best killing percentage, the quickest maturity, the most economical use of food, and will in turn produce other pigs of the same kind. In the fall of 1913 W. H. Ginn & Son of Corcoran bought two pure-bred Duroc sows three years old already bred. They cost $100. They raised nine sows and seven boars. In the fall of 1914, three of the sow pigs were bred and sold for $105. Last spring those three gilts had 25 pigs and raised every one. Six of the first sow pigs were kept as the foundation for his own pure-bred herd and no more females have been bought. Last September, when seen at his ranch, he had 120 head of pure-breds which delight the heart of any hog man, to say nothing of the boar pigs he has sold in the meantime. The sows have averaged eight pigs per litter and raised 85 per cent, though the hog sheds are built simply of scraps of lumber that would have been wasted, and the

feed all grown on the place. He has fifty beauties farrowed by six sows last June. He takes pride in looking at them, in feeding them, in showing them to visitors and while they have probably paid their way through the sales of breeding stock and culls for pork, they have at the same time produced a surplus of 120 head from the two original sows in two years. These 120 head are each worth about eight times as much cash as if they were scrubs.

### Gestation of Sheep and Swine.

*How many days do sheep and hogs carry their young, and how often do they come in heat?*

Usually when not with pig or suckling, a sow will be in heat about 3 days out of 21, or once in three weeks. Whether or not a sow is safely in pig will be known about 20 or 21 days after breeding. The period of gestation is about 112 days from date of service although young sows are apt to carry their pigs for a slightly shorter period, sometimes 106 to 108 days, and old sows may be taken a longer time, extending to possibly 115 days. Ewes when not bred or suckling come in heat from 2 to 4 days out of 7 months and if they do not become impregnated after service, heat will recur after about 17 to 28 days. The average gestation period of ewes is 150 days, with extremes varying between 146 and 157 days.

### Sheep Breeds for Range.

*What is the best sheep for mountain range? Is there a breed that frequently drops twins?*

Merino sheep are conceded to be the best range sheep, due to the fact that they are more easily herded and have the vigor and constitution to stand the hardships which are required of them at times. Outcrosses are made at times to some of the mutton breeds, but in all of our larger flocks of range stock Merino blood predominates for the above reasons. All breeds of sheep drop twins, which accounts for the high percentage of lambs that are raised where good care is exercised.

### Sheep on Alfalfa.

*I have thought of raising grade Shropshire sheep, using alfalfa as feed. What would the outlook be for the sale of bucks, and could 200 head be kept on 40 acres of alfalfa, yielding 175 to 200 tons per year?*

There has been a heavy demand for well-bred Shropshire rams. The sheep of the future will be largely grown in the manner you describe. There is, however, one requirement that you will have to live up to and that is to secure well-bred foundation stock. The outlook for such an undertaking depends more upon the class of stock you raise and upon your selling ability than anything else. Experience seems to show that you are well within your limit in figuring five head of sheep to the acre of alfalfa.

### What Kind of Goats?

*Around here, hair goats are said to pay better than the better grades of Angoras; are said to raise more kids; are larger for mutton; and are also hardier. Is hair goat a local name for a mixed Angora and a common goat? The hair goat does not pay to shear, but is somewhat heavier than the Angora, say 35 to 50 cents per head heavier. Now, if this is so, and as in a former article in the Press you said the Angoras only averaged 55 cents per head for mohair, it would seem to me that the lower grade of Angora or hair goat would be better to raise, as a man would not have to shear. Being hardier also, this ought to run the difference up to 75 cents per head. Also, what about the future of the goat-mutton market?*

We take it a "hair goat" is just a goat, whether he has a little Angora blood or not, for to get high-priced mohair a goat must be very near pure-bred Angora. The common goat is much hardier than the Angora, which must have intelligent handling and some protection during the rainy season. If this is to be given, well-bred Angoras would be a more profitable venture than the hair goats as they do not cost very much more in the first place; the annual clip of mohair is in their favor; when killed, their skins are worth $1.75 to $2.50 for making chaps, whereas the hair goats' skins are of considerably less value. As to the future of the butcher demand for goats, the present outlook is that mutton will command good prices. The butcher does not desire the older goats, so you would have to turn off your young goats.

### Angora Goats.

*Will Angora goats do well pasturing on logged-off land, where there is a second growth of fir, spruce, etc., undergrowth of brush, also weeds, and some good growth of grass? What is the average price of the hair, and pounds per head?*

Angora goats are often used for clearing land and would do well under conditions described. The price of mohair in 1908 ranged from 22c to 25c per pound, while in 1913 it averaged 34c per pound. The average weight of the fleece of American Angoras is about two and a half pounds, according to Farmers' Bulletin 573, "The Angora Goat." This publication can be obtained from the Secretary of Agriculture, Washington, D. C. It gives excellent brief discussions of Angoras and of questions relating to the management of the flock.

### Points on Milch Goats.

*What is the milking period of a milch goat? What is the average quantity daily? Is there a market for their milk and what price obtainable? What price must one pay per head for milch goats?*

The period of lactation with milch goats, as with cows, depends upon individuality, breed, feed and general care. It is a fair to good goat that will average two quarts a day for seven or eight months

although some do for 12 or more months. The former goat would probably give 2½ to 3½ quarts a day at three weeks after kidding. One that will give more is especially desirable. That can not be unless the animals are fairly well-bred and cared for properly. Some do give more than that amount but not many give more than 4 to 5 quarts daily at any time. Does should be two years old before kidding. Fairly well-bred to pure-bred doe kids at weaning time (four to five months) are priced at from $10 to $50 or more. At a year old they will be worth from $25 to $75, depending upon their development. At 20 to 24 months of age and in kid by pure-bred registered bucks, they bring $35 to $100, depending upon their individuality. There is usually a ready market, as goat milk is especially recommended by many doctors for invalids and babies in particular. Fifteen cents a quart is considered the minimum by most raisers, although it often sells for 20 cents or more.

### Small Cow-Barn.

*State the best arrangement, the necessary floor space, and the cost of materials for a cow barn for* 15 *cows—nothing fancy, but substantial and clean.*

A milking shed for 15 cows, built either at right angles to the barn where the feed is stored or at the end of same, should be about 20 feet wide and from 50 to 57 feet 6 inches long, according to the space allowed for each cow. This space is usually from 3 feet to 3 feet 6 inches. Where the cows are only to be kept in the barn while fed and milked the space for each cow is generally only 3 feet. Allowing only the latter space, 45 feet for the cows and a gangway 5 feet wide at the end where the shed connects with feed barn would be sufficient. There should be concrete floor arranged as follows: feed alley and manger from outside wall to stanchions 8 feet; floor stanchion to gutter, 5 feet, with one inch fall to gutter; gutter 18 inches wide; passage way from gutter to outside wall 5 feet 6 inches. There should be about ten 2x3 feet windows in the barn. Another plan would be to build the shed for 16 cows with two rows of cows and a feed alley 10 feet wide between the rows. This milking shed would be about 29 feet by 34 feet and could be extended if the herd increased in number. The cost of the concrete floor and foundation would be about $200.00. The cost of lumber and building can best be estimated by a carpenter who knows the price of lumber on the ground.—F. W. Andreasen, Sec'y State Dairy Bureau.

### Dairy Barn Construction.

*I am planning to build a milking barn, and desire advice as to the following dimensions: Back wall* 8 *feet high, walk or driveway* 4 *feet, gutter* 16 *inches, being* 4 *inches deep on back side and* 6 *inches deep in front, platform* 4 *feet* 8 *inches, curb for stanchion support* 5 *inches thick and* 8 *inches high, manger* 6 *inches deep and* 2½ *feet wide, sloping from feed alley to bottom of curb, and a feed alley* 8 *feet* 6 *inches, having slightly curving surface toward the mangers. How much*

*slope to the foot should platform and driveway have toward the gutter? Should the bottom of the gutter be level or should it slope toward one side, and if so, to which side? How much slant should the floor have lengthwise to give sufficient fall for flushing out the gutters? What finish is best for concrete to prevent cows from slipping? Will use steel stanchions. Is it best to use swivels in the chain hangings or not?*

The height of your back wall is satisfactory, but build the first four feet out of concrete, making a wall about four inches thick. This will allow flushing off any manure that may splatter against the wall. Windows, for ventilation and light, should be placed above this concrete, with provision made for opening or closing them. Five feet instead of four feet should be allowed for the walk back of the gutter, as it will give you more room for driving cows in or out, while others are in stanchions. The walls of the gutter should be the same height on both sides, preferably 2½ or 3 inches, and the entire gutter should slope with the floor of the barn. Deep gutters are not desirable as cows are more apt to receive injuries from slipping into them. The bottom of the gutter should slope slightly toward the outside wall, allowing the liquid manure to drain off from the solid matter. Build your platform 5 feet wide, and by having swivel stanchions you can regulate the distance between stanchion and gutter to conform with the size of your cows. The dimensions you give for the curb are satisfactory, but make about a 2-inch hole in the bottom of each manger, thus allowing an outlet for water used in flushing. We see no reason for having feeding alley convex in shape. A two-inch slope from manger to gutter should drain your floor satisfactorily, and about six inches slope to the 100 feet will be satisfactory for the gutter and floor. If not over 50 feet long, drain floor and gutter to one end, but if say 100 feet long, have floor and gutter slope to center of barn, using a drain at that point to carry manure and liquid out of the barn. A rough floated cement finish is most satisfactory for platform and walks in cow stables, as it prevents slipping. Use the swivel stanchions as they allow more comfort for the cow while in the barn.

## Estray Law.

*What are the necessary steps to be taken in advertising an animal under the estray law of California?*

The present estray law of California provides that any person taking up an animal "shall confine same in a secure place and within a week thereafter shall publish in some newspaper of general circulation, printed and published in the county in which such estray is found, and also file with the County Recorder of said county a notice containing a description of the animal or animals taken up, with the marks and brands, if they have any, together with the probable value of such animal, and a statement of the place where the taker-up found and where he has confined the same. * * * The said notice shall be so published for two weeks. * * * If, however, the animal has the owner's mark or brand upon it, and such brand or mark has been recorded according to law, or if the finder knows the owner of said animal, or the person

having charge thereof, then within five days after said animal is taken up he shall notify the owner of said animal, or the person having charge thereof, which notice shall contain the same information as the notice to be published and recorded."

### Salt-Curing a Calf Hide.

*How can I cure a calf hide for a mat?*

Trim the forelegs off above the knees, the hindlegs at the second joint or hock, tail cut off within two inches of the body, forehead, lips, ears, etc., should come off, or any other useless long pieces on any part of the hide. All flesh and fat should be removed, the hair side should be swept clean of all dirt, the flesh side should be washed with warm water to remove blood, etc. Then the hide should be salted evenly all over, using about 12 to 18 pounds of coarse salt according to the size of the hide. See that every part of the hide is exposed to the action of the salt. Place the hide on the floor, allow to cool, then salt evenly. Leave for six hours to thoroughly cool, then fold the hide in halves, head to tail, sprinkling a little salt on the hair side next to the points and tail. By this means the flesh side does not come into contact with dirt and blood on the hair side. Leave folded for from seven to ten days, after which they may be taken up and swept clean, and any further trimming done as required.

### Frog Farming.

*Would it be profitable to raise frogs for market?*

S. Beck & Company of San Francisco, who make a specialty of frogs and terrapins, advise us that they know of no one in California who has made a success of raising frogs for the market. There has been some interest lately and two or three parties have recently started, but it is not known what success they have had. There is always a market for frogs. Beck & Co. pay $1 to $3 per dozen alive, according to the size of them, and also pay the transportation charges. Their supply is now sent in by men who make it a business to catch wild frogs, but the supply is getting scarcer every year, and possibly you could make money if you have land that isn't good for cultivation and is good for frogs, and if you protect the frogs against their natural enemies, snakes, turtles, birds, etc.

# PART VI. FEEDING ANIMALS*

### Calves and Separated Milk.

*Is there any danger in feeding separated milk to calves? I have fed mine separated milk with meal, sometimes linseed, and sometimes calf meal, and they have had well cured alfalfa also. Four have died suddenly from a violent bloat that even sticking could not relieve.*

This is not due to separated milk, but is more likely to have been caused by unclean milk vessels, which had fermentable material. Cleanse the vessels after use, in one-half per cent solution formalin, and use vessels without corners or crevices.

### Calves Without Milk.

*Can I buy calves and raise them without milk? Would canned milk do?*

It would not be profitable to use canned milk. There are a number of calf meals on the market which are used as a substitute for milk; but, according to Professor Woll, the conclusions drawn from a number of experiments with a number of these feeds were that while good, strong, healthy calves could be raised with them, it is much cheaper for the dairyman to mix his own meal. He advises the use of the following mixture: 20 parts each of ground oats and wheat middlings; 10 parts of corn meal; and 5 parts of linseed meal or ground flaxseed. He also states that if skim milk is not at hand, a good substitute is third grade dry skim milk powder. This is what is commonly known as dry milk and may be purchased at any store handling a full line of feeds.

Old process oil meal and wheat middlings mixed half and half by weight made into a gruel with one pint of the mixture per gallon of warm water is recommended by an old dairyman.

### Better Sell the Calf.

*I have a two-weeks-old bull calf, for which I am offered* $5. *I have no pasture, but will have more oat hay than I need for horses. Will it pay to raise calf to sell for beef? Can I do so on oat hay alone, or would it pay to buy alfalfa hay at* $12 *per ton, or had I better sell the calf now, also the hay?*

*All answers signed "F. W. W." are by F. W. Woll, Professor of Animal Nutrition, University Farm, Davis, and author of "Productive Feeding of Farm Animals"—a treatise on modern science and practice of profitable feeding: Postpaid $1.50 from Pacific Rural Press, San Francisco.

As your calf is presumably not pure-bred and therefore has only potential beef value, we would take the $5 and sell the extra hay or feed it to a heifer calf.

### Pasturing or Rack Feeding?

*Can I get better results from pasturing dairy cows on the alfalfa or by cutting the alfalfa green and feeding it in the corral?*

This question has been much discussed and the arguments have favored corral feeding or soiling. Aside from the fact that feeding in the racks makes a lot of extra work, due to the daily hauling from the field and the extra time spent in mowing small amounts at a time, there is no objection, so far as we know, to that system, while the practice of pasturing has a number of objections; namely it is a bad thing for the alfalfa, as the sharp hoofs of the cows cut the crowns, etc.; there is waste in pasturing due to tramping. Another objection is that cows are lost often in pasturing, through the bloat, which seldom happens when green alfalfa is fed in corrals. The common practice is to cure a part of every crop cut, and feed the balance in the above manner, to have good feed the year round.

### Feeding Conditions of Sorghum Fodder.

*Please tell me when to cut sorghum for fodder. What will be the feeding value of dry fodder for milch cows?*

Sorghum may be cut for fodder any time after the seeds are in the early milk stage. At this period of growth the fodder is most palatable to stock and contains a fair proportion of dry matter. If it is left standing until nearly matured a larger yield of feed materials will be obtained per acre, but the fodder will be somewhat less digestible than when cut earlier. The largest amount of digestible matter from an acre will, however, in general be secured when the kernels are in the dough. The reason why sorghum is always left to mature before being siloed is that it will make a very acid silage if cut before this period, owing to the relatively large proportion of sugar and other readily fermentable carbohydrates which the plants contain at the earlier stages of growth.

The feeding value of dry sorghum fodder will depend on the stage at which it is cut and the care with which it is cured. We may assume as a general proposition that such fodder is worth perhaps two-thirds that of grain hay. But for the fact that the relatively thick stems contain considerable water (30 to 40 per cent) there is no reason to believe that it would have a lower feeding value, ton for ton, than hay from the common grasses or cereals.—F. W. W.

### Falling off in Milk with Good Feeding.

*We have been feeding a ration of about one pound of cane molasses, two pounds of cocoa meal, one pound rolled barley, and three pounds alfalfa hay, chopped by a silage cutter. We have been milking about*

*fifty-four head. Aside from the mixed ration, our cows have had alfalfa hay of a good, clean quality fed in the rack. Our cows are constantly falling off in their milk production, some as much as 14 to 16 pounds in a day. We have been having considerable trouble with our cows scouring. Some say the cane molasses caused the trouble; but a number have told us that it was the chopped hay.*

The only feed among those mentioned that has decided laxative properties is cane molasses. Under conditions stated the safer plan would be to omit it from the mixture. We have not had any difficulty with scouring in feeding chopped alfalfa hay to our cows, and do not believe that this feed is responsible for the trouble. The fact that the cows are falling off rapidly in their milk production cannot be due to the method of feeding adopted unless they have been greatly weakened by continued severe scouring. From a physiological point of view the ration fed can hardly be improved upon, except perhaps by feeding somewhat more barley or some other low-protein grain feed and reducing the cocoanut meal correspondingly. If cows fall off in their flow of milk more than 5 per cent per month during the early part of the lactation period and more than 10 per cent per month toward the end of the lactation, there is something wrong either with the method of feeding practiced or with the cows themselves. In this case the chances are that the trouble is in the cows themselves; that they are not persistent milkers or good dairy cows. A good cow should give milk for at least ten months during the year, and should not go down more rapidly from month to month in her milk yield than stated above.—F. W. W.

### Balanced Ration for Cow.

*I would like to know a balanced ration for a cow, including dried beet pulp.*

The cheapest ration that a California farmer can feed his cows this season (1915) if he has alfalfa, will be about as follows: Alfalfa hay ad lib., say 25 pounds per head daily; dried beet pulp, rolled barley and cocoanut meal, equal parts each by weight, 1 pound of the mixture for every 5 pounds of milk which the cows yield. This will make a balanced ration and will produce as satisfactory results as any ration for milch cows which does not include some succulent feed, either green feed, silage, or roots. It may improve the ration to some extent to feed the beet pulp wet, soaking it in 3 or 4 times its weight of water, about 6 hours before feeding time, but the advantage gained by this method is hardly sufficient, in my experience, to make it worth while to go to this trouble in feeding the grain mixture.—F. W. W.

### Fattening Feeds.

*Please tell me the best feed to use to fatten an old cow?*

Farm animals that are to be fattened should receive considerable amounts of starchy or other carbonaceous components in their

rations, and these must be furnished largely in concentrated form so that a large share of the nutrients contained in the feed will be available for productive purposes and will not be used up in the work of digestion. Grain or other starchy concentrates must, therefore, be fed freely. There is no single feed that will fatten animals more readily than Indian corn, which is the most important fattening feed in this country. The grain sorghums and other cereals are also excellent for fattening purposes. It is always well to give a mixture of feeds rather than a single feed only, as animals will eat more on a varied diet and will go to their feed with a keen appetite when given a variety. At present feed prices in this State, a mixture of either rolled barley and dried beet pulp, or barley, milo, and beet pulp, fed in the proportions of 2:1 or equal parts by weight, respectively, will be about the most economical and efficient grain ration that can be fed to fattening animals. Either grain mixture fed liberally and with a good grade of hay will fatten cattle in a short time.—F. W. W.

### Making up a Ration for Cows.

*What would be a balanced ration made up of the following ingredients and how much of this mixture should be given to cows giving 30 pounds milk per day: ground barley, linseed oil meal, heavy dairy bran, alfalfa meal and steam dried beet pulp? The cows at present are having clover hay in addition to the mash, but later will only have grain hay. We have silo in construction and corn growing, to have silage later, but until then must make up a ration of what I have. Would it be better to add ground oats also?*

The best nutritive ratio for cows giving a certain amount of milk per day will vary according to the prices of the available feeding stuffs. If the protein feeds, like alfalfa and clover, are cheap compared with starchy feeds a narrower nutritive ratio may be fed to better advantage than when the opposite is true. With grain hay as the main roughage, it is necessary to feed more protein (flesh-forming substances) in the form of concentrates than if alfalfa or clover is fed; fortunately equally good results can, as a rule, be obtained in this way by furnishing somewhat more total digestible matter in the ration. A nutritive ratio of about 1:7 will be about right under these conditions and with average prices of the feeds given. It is not necessary to feed ground oats in addition to the other feeds, as these furnish ample variety to the ration.

I would suggest that about 8 pounds of concentrates be fed, with 20 pounds of grain hay per head daily, and that the grain mixture be made up of barley, wheat bran, and dried beet pulp, in the proportion of 3:1:1, a small amount of oil meal (½ to 1 pound) being added to increase the protein in the ration and as an appetizer. A ration made up as suggested, with one pound of oil meal, will have a nutritive ratio of nearly 1:7 and will contain sufficient food materials to meet the needs of cows giving 30 pounds of milk a day.

When corn silage is available, the roughage will contain still more starchy feeds and it will be necessary to supply more protein

in the concentrates by feeding more bran or oil meal. The former feed would be likely to prove the cheaper source of protein of the two. The best combination of feeds to be given in each case depends largely on the relative market price of these.—F. W. W.

### Pumpkin Seeds and Cows.

*What effect have pumpkin seeds, fed with the pumpkins to milk cows?*

No ill effects. We have fed them to cows ever since we were a kid. Give the cow the whole thing after smashing it so she can get hold.

### Growing and Feeding Squashes.

*Give the feeding value of sweet potato squash for hogs. They are of a slate color and grow about 18 to 24 inches long and about the shape of a sweet potato. What is the feeding value of pumpkins?*

There is no notable difference in the feeding value of field squashes and pumpkins. They have all been selected toward the same standards of quality and whatever has a good name has reached similar standing. They have a good record as hog feed, though the pork has been reported off color when too much squash is fed. For the same green weight the squash family would be worth a little less than half as much as alfalfa for growth and a little more than half for fattening.

### Squash and Pumpkins for Cows.

*What about feeding pumpkins to cows? I am told that they are good for hogs, but will dry up milch cows.*

There is no conclusive evidence that pumpkins have a tendency to dry up cows, although some farmers believe that such is the case. The fact that many leading dairymen are feeding pumpkins regularly to their cows so long as they last, shows however, that at least some farmers think well of them, and also suggests that the difference of opinion as to their value is very likely due to the way in which they have been fed. If cows do not get much other feed, or if fed only a poor quality of roughage with the pumpkins, they will be likely to go down in milk yield more rapidly than they should. On the other hand, fed with good hay and some grain the results will be most satisfactory. Pumpkins are low in nutritive properties, containing only about ten pounds of dry substance per 100 pounds, and they cannot, therefore, be depended on to supply any large proportion of the nutrients required. It is always advisable to feed some grain to cows producing medium or large flow of milk, except when they have abundant pasture. With such pasture it is rather unnecessary to feed pumpkins, and they are of advantage more as an appetizer in that case than for the amount of nutrients which they supply. When fed as sole succulent feed to dairy cows, it is advisable to add rolled barley, or some grain mixture like barley, dried beet pulp and cocoanut meal, equal parts by weight, at the rate

of one pound for every six or seven pounds of milk which the cows produce. These feeds make a very satisfactory grain mixture for dairy cows on alfalfa and roots or silage.—F. W. W.

### Feeding Dried Beet Pulp.

*My cow declines to eat beet pulp, either dry or soaked. I persuade her by mixing cocoanut meal with it, one part cocoanut to two parts beet, soaked. What is the feeding value of beet pulp compared with bran or alfalfa meal?*

Dried beet pulp is not particularly palatable feed, but it does not take dairy cows long to get accustomed to it and they will eat large amounts right along when once started on this feed. The best way to teach cows to eat pulp is to feed a little at first with other concentrates, and gradually increase the allowance until the grain mixture decided upon has been reached. Some farmers prefer feeding the pulp wet, and some feed it dry. It does not make much difference how it is fed, although most cows take to it more readily when it is fed wet than when dry and will eat larger quantities of it in the former form.

Cocoanut meal is all right to mix with the pulp. A mixture of barley and cocoanut meal, or barley and mill feed, is better, since several feeds make a more appetizing grain mixture than one or two and will favor a high production. Your cow did not need much more feed than she was furnished in the roughage fed, or you did not try her long enough. Good dairy cows will always respond to grain feeding and take to a mixture containing beet pulp as readily as other grain mixtures.

The fact that beet pulp, as a general rule, is a relatively cheap feed on the Coast makes it a very desirable component of our dairy rations. It contains no injurious component or chemical substances that would render it undesirable as a dairy feed or a component of the grain ration for dairy cows. Its feeding value may be considered nearly equal to that of wheat bran and somewhat higher than that of alfalfa meal, ton for ton.—F. W. W.

### Barley Straw for Dairy Cows.

*My barley turned yellow before it fully matured. The barley is considerably shrunk and I think it is not fit to sell, so I expect to feed it to my dairy cows. The straw is quite tender and sweet. Would it be profitable to cut up the straw fine and mix it with my barley (rolled) and some other concentrates?*

Barley straw has a similar feeding value to oat straw, and contains about forty per cent digestible carbohydrates. A considerable portion of this is, however, in the form of fiber and is of doubtful value for productive purposes, but there is enough valuable digestible nutrients in it to fully justify its use for feeding farm stock. It is used as a regular part of the rations for horses and fattening cattle in

European countries, being cut fine and fed wet mixed with concentrates or sliced roots. Since the correspondent is feeding alfalfa hay it will be advisable to feed the cut straw with either rolled barley or molasses. All these feeds are high in carbohydrates (starchy components) and, therefore, supplement nicely alfalfa which is high in protein (flesh-forming substances). A good method of feeding will be to wet the cut straw with molasses diluted with three to four times its weight of water and mix rolled barley with it. The latter may also be fed alone.—F. W. W.

### Feeding Value of Sweet Potatoes.

*What is the feeding value of sweet potatoes for milch cows, when fed in conjunction with alfalfa? Price is no object as I have plenty of both.*

Three pounds of sweet potatoes contain almost as much dry matter and starchy feed components as one pound of Indian corn or barley. Under the conditions stated, they will make a valuable feed for dairy cows and are preferably fed sliced in quantities of twenty to thirty pounds per head daily. Sweet potatoes are rich in sugar and starch and are low in flesh-forming substances (protein); for this reason they are especially good supplementary feeds to be given with a high-protein feed like alfalfa.

### Cotton Seed Meal as Stock Food.

*What is the feeding value of cotton seed meal to milch cows? Is it as good as bran at the same price or not, and what would be the best way to feed it?*

Cotton seed meal can be fed safely to dairy cows in large quantities, if desired. Ordinarily, however, only a couple of pounds per head daily are fed, in mixtures with other concentrates. It is not particularly palatable to cows when fed alone and is, as a rule, expensive in comparison with other grain feeds. It has, furthermore, an undesirable effect on the quality of the butter when fed excessively, making it hard and tallowy, which is important in case the milk is used for making butter. At the same price as wheat bran, it is a cheap feed, however, and especially if fed with grain hay or wild hay a mixture of wheat bran and cotton seed meal, equal parts by weight, will make a good combination. In case the roughage fed is alfalfa hay, it would hardly be advisable to feed more than about a pound of cotton seed meal per head, if it be fed at all. The best grain feeds in this case would be barley and wheat bran mixed in the proportion of three or two of the former to one pound of bran, according to the market prices of the two feeds. Alfalfa hay, cotton seed meal, and wheat bran are all protein feeds and rations made up of these feeds will contain too much of this compound for best results, both as regards production and the health of the animals. Cereal grains, dried beet pulp, etc., with low-protein feeds, like mill feeds, therefore, had better be included in the ration when alfalfa is fed.—F. W. W.

### Cocoanut Meal, Barley, Bran.

*How does cocoanut meal compare with barley and bran for dairy cows and hogs? It costs* $1.60 *per cwt., and bran and barley cost a trifle more.*

Cocoanut meal makes an excellent feed for dairy cows and is also a good hog feed although it is not as often fed to the latter class of farm animals as to cows. It has a somewhat higher content of digestible components than barley and, pound for pound, is worth more than either barley or wheat bran as a feed for cows. It is always fed mixed with other grain feeds, however, the kinds and amounts of these depending on the relative cost of the feeds. At the market prices given, cocoanut meal is the cheapest of the three feeds and it will therefore pay to include a considerable proportion of this in the mixture. If desired, as much as three or four pounds per head daily may be fed to dairy cows, but if a good quantity of alfalfa hay is fed, it will not be desirable to feed much more total grain than that. I would recommend a mixture of rolled barley, wheat bran, and cocoanut meal in the proportion of 1:1:2 by weight, feeding one pound of the mixture for every four or five pounds of milk that the cows are producing.—F. W. W.

### Sugar Beets for Hogs.

*Would you advise planting sugar beets for fattening hogs? Their value compared with Egyptian corn, and comparative yield? I have pure water, good alfalfa, and intend raising melons and pumpkins to feed while hogs are growing and wish to know the best and most productive crop to fatten them on.*

We do not consider sugar beets as a fattening food for hogs, and in no way a substitute for grain. They are a good succulent feed for growing but you have already so much in that line listed that you do not need the beets. If you need fattening grain, grow barley or Egyptian corn or Indian corn—whichever your conditions best favor.

### Whey as a Swine Food.

*Is cheese whey good for hogs? What should be fed with it to growing pigs and also what is best for fattening purposes?*

Whey is generally used for feeding hogs in cheese districts and makes a good swine feed when fed in sweet, or not very sour, condition. It has about one-half the feeding value of skim milk or buttermilk for feeding swine. It is safe to assume that twelve pounds of whey will save you a pound of grain when fed to swine under sanitary conditions. At ordinary prices for grain this would make it worth about 12½ cents per hundred weight, which may be considered a fair average price. Whey is relatively higher in starchy substances and lower in flesh-forming substances (protein) than either of the other dairy products mentioned, and may, therefore, be supplemented by more high-protein feeds, like middlings, or shorts, and linseed meal, along with grain feeds like barley, Indian corn, ground Kaffir,

milo, etc. I would recommend for feeding growing pigs on whey a mixture of ground barley, shorts and linseed meal in the proportions of 2:1:1 by weight, or of barley and shorts only, equal weights, giving two per cent of the grain feeds per weight of pigs and making a thin slop with the whey. As the pigs grow older the proportion of grain is increased. Fattening hogs are fed relatively less whey, say three pounds per pound of grain fed, which may be made up of similar feeds as those mentioned, except that linseed meal is left out and more of starchy grains, like barley and grain sorghums, be included.—F. W. W.

### Prevent Greed in Hogs.

*What is the best way to feed hogs so that each one can get its share, when you have to feed a large number together?*

We only know the old way of bars on the troughs so only one head can get in at a place.

### Hogs for Feeding.

*I want to fatten hogs for the market. I have fifty acres. When is the best time to get the hogs and what age? What crops could I grow for them, including pasturage?*

Any time one has the necessary feed on hand to fatten hogs would be the proper time to buy them. Ordinarily, a hog from six to ten months old would be ready to fatten. Any grain that would yield the largest amount would be the best to plant. Corn is one of the best fattening feeds, and if the land is suitable for the successful growing of corn, we know of nothing better. Alfalfa, where the soil and climate are suitable, is no doubt the best pasture. But alfalfa is not a hog fattener. It takes grain or some other feed that contains a large percentage of what is known as carbohydrates to produce fat. Sugar is a great fattener, and possibly some by-product of the sugar factory would be excellent. One must study the conditions under which he is operating and work out these things for himself to a great extent.—Chas. Goodman, Williams.

### Barley and Shorts for Pigs.

*Which do you consider better for fattening hogs, crushed or whole barley with skimmed milk? I am feeding some small pigs. They chew the crushed barley and spit it out, but do not the whole barley. Also, which do you consider the cheaper feed, whole barley at $23 per ton, or shorts at $26 per ton, with skimmed milk?*

Barley alone is not very palatable for young pigs and they eat it much better when mixed with some other feed. This accounts for the trouble in getting the pigs to eat the crushed barley and sometimes there is as much trouble with the whole barley. We find that a little more of the crushed barley is digested by hogs than the whole barley, undoubtedly enough to pay for crushing. It seems more desirable, however, to soak the barley, either crushed or whole, than to feed it

dry. It does not need to be soaked for more than twelve hours, but the pigs will eat it much more readily than dry. It can be soaked in water or in the skim milk that is being fed with it. The most economical ratio to feed it in is one pound to three pounds of skim milk.

Whole barley at $23 per ton is somewhat cheaper than shorts at $26 per ton, but for younger pigs we would recommend a mixture of the two rather than either one alone. Especially is it not advisable to feed shorts alone. The following ration should give desirable results: Barley three parts, shorts one part, and skim milk twelve parts, by weight. That is to say, we would feed three pounds of skim milk for each one pound of grain mixture. The shorts may be slightly reduced in amount in proportion to the barley as the pigs increase in size.—Prof. J. I. Thompson, University Farm.

### Molasses for Pigs.

*Is stock molasses good for growing pigs?*

Molasses is primarily a fattening feed and does not, therefore, supply the kind of nutrients that a growing pig needs. It is composed of 50 to 60 per cent of sugar and similar substances, and only a few per cent of digestible protein (flesh-producing substances). On account of the laxative properties of molasses it should, moreover, be fed in only small amounts to young animals. It would be all right, however, to feed a small proportion of molasses with grain and shorts so as to increase the palatability of the ration, say ten pounds for every fifty pounds of ground barley, and forty pounds of shorts. The addition of a little tankage, amounting to about one-tenth of the grain mixture, would further improve the ration for pigs and insure a rapid, healthy growth.—F. W. W.

### Feeding Little Pigs.

*What amount of barley should be fed pigs while sucking and also after weaning? I have plenty of alfalfa and alfalfa hay, and skim milk. Will pigs do fairly well on rolled barley and alfalfa, and alfalfa hay?*

Pigs, while sucking and immediately after weaning, will eat approximately six per cent of their live weight, but probably a better plan is to feed them what they will clean up readily in fifteen or twenty minutes of feeding three times a day until they weigh 75 pounds, after which feeding twice per day will be satisfactory. As they get older, the percentage of their live weight that they can consume will decrease until at 300 pounds, a hog will ordinarily not eat over two and a half per cent of its live weight. Pigs will do fairly well on rolled barley soaked for twelve hours, and alfalfa pasture, but you will probably not get very desirable results in feeding alfalfa hay to growing pigs. They can eat a small amount, but it is too bulky for them. Brood sows can often consume one pound of alfalfa hay for each three pounds of grain, but this ration would be too bulky for growing pigs.—Prof. J. I. Thompson.

### Feeding Young Pigs and Dams.

*What is the best kind of feed for little pigs from the time they begin to eat until weaning time, if you have no cows' milk to give them? I have some about four weeks old that I have been feeding middlings and bran, mixing with water to a substance like mush and they are scouring. Would alfalfa meal added to any mixture be good for them? I have been feeding the mothers on beets. The pigs seem to eat the tops and a little of the root. What would you advise feeding the mother for best results?*

The scouring of the pigs may be due to their eating a grain mixture containing wheat bran, or to eating beet tops, or both. Wheat bran is quite laxative; it is relatively high in fiber, containing about ten per cent thereof or more, and also contains an organic phosphorus compound phytin which has a decided laxative effect. The same holds true with beet tops, but in this case the laxative influence comes from their high potash salts, mainly oxalates. Bran is not desirable feed for pigs for the reason stated. Middlings or shorts, on the other hand, make an excellent pig feed, and I would suggest that you feed the pigs a mixture of ground barley and middlings in the proportion of two to one by weight, or include in the mixture a little linseed meal or tankage. Both of the latter, and especially tankage, are high-protein feeds and are valuable for feeding supplementary to the grain feeds given. Ground milo or Kaffir corn may be substituted for barley, if available and cheaper. It would not be advisable to add alfalfa meal to rations for young pigs as it is too high in fiber. A small amount may do no harm, but tankage is better.

The sows should receive plenty of highly digestible feeds, like cereal grains and mill feeds, with protein feeds like alfalfa, linseed meal, and also some succulent feeds, pasture or roots. Wheat bran is all right for sows, but if they are receiving alfalfa hay or green alfalfa, then middlings are better and a cheaper feed. Feed the pigs at the rate of at least two per cent their weight of grain daily and the sows about one-half pound of hay and three to four pounds of grain feed daily per 100 pounds body weight. If roots are fed they may take the place of grain in the proportion of ten pounds for every pound of grain fed.—F. W. W.

### Rations for Brood Sows.

*I think of putting in about ten brood sows on land in the mountains of central Monterey County and can raise all of the feed, such as wheat, barley, emmer, Kaffir corn, Sudan grass, rape, stock-beets, Jerusalem artichokes, English horse beans, sunflowers, melons, etc. Have some acorns each year. No alfalfa sown yet. No milk. Now which of this list would make the best combination for a balanced ration? Would it be practical to "hog-off" all of the grains? We have a large range.*

By referring to my book "Productive Feeding of Farm Animals," it may be seen that all the feeds mentioned are good swine feeds; and the question whether they should enter into the ration of the sows must be decided on the basis of relative yields and cost of production.

There should be no difficulty in selecting from the long list of feeds given a combination that will make an excellent balanced ration for brood sows. As the cost of the different feeds is not given one cannot figure on the economy of any special system of feeding, but it is doubtless both practical and economical under our conditions to "hog-off" corn, Kaffir or rape, and all these crops make first-class hog feeds. The following grain mixture may be recommended: Barley, emmer, Kaffir corn and horse beans, equal parts by weight.—F. W. W.

### Feeding Scrub Hogs.

*What is the best way to feed a lot of nine scrub hogs for fattening? I have milo maize, ground head and all, tankage, about 75 pounds skim milk daily, and alfalfa hay. Hogs weigh about 50 pounds apiece with good frames. Would you soak milo in milk or soak with water and add milk? Should tankage be fed wet or dry? That is, wet long before feeding?*

Feeding scrub hogs will not differ from that of feeding pure-breds if satisfactory results are to be obtained. With the feeds named there should be no difficulty in securing satisfactory gains. We suggest that the hogs be fed three per cent of their body weight in the form of grain, viz., nine-tenths of milo and one-tenth tankage, the milo being soaked in water or skim milk and the tankage added just before feeding. In addition, the hogs are given all the alfalfa hay they will eat and about four times as much skim milk as the amount of grain fed. This will take all the available skim milk at the start and if more milk cannot be obtained, the proportion of skim milk to grain is reduced and somewhat more grain fed so as to secure a body weight of toward 200 pounds at the close of the fattening period.—F. W. W.

### Grain for Fattening Hogs.

*Our barley costs us about* $1.10 *a cental, and it takes* 500 *pounds to put* 100 *pounds of meat on a hog. We are offered* 6 *and* 6½ *cents a pound for our fat hogs; and then no market close and there seems to be not much of one in San Francisco. Will you please tell me if I am right, and if so, will it pay?*

It is true that it will take toward 500 pounds of grain to put 100 pounds on the hog, but this amount can be greatly reduced by furnishing cheaper feed with the grain, like alfalfa pasture or alfalfa hay, in which case only 200 to 300 pounds will be required per 100 pounds gain in body weight. It is often possible to utilize barley in stubble fields for fattening hogs. This would otherwise be wasted and has no market value. Feeding grain to fattening hogs also pays for the reason that it shortens considerably the feeding period and improves the dressing percentage and the quality of the pork produced. According to the figures given by the correspondent he is getting full value for his grain and has not, therefore, much cause for complaint. It is, of course, necessary to use good judgment in feeding grain to hogs as well as to their other farm animals in order to come out ahead.

Fortunately we can have excellent alfalfa pastures in the main swine-raising sections of our State and are, therefore, able to lessen the cost of producing pork.—F. W. W.

### Fattening Hogs.

*What is the best and cheapest ration to fatten hogs on, and how much should be fed daily for best results. How much should a pig gain per month? On the average, how much should a five-month Poland China weigh?*

The best and cheapest ration to fatten hogs depends on the market price of feeds. In a general way it may be said that alfalfa pasture is the cheapest and best feed for growing hogs, but should be supplemented with grain. If barley is not too high in price, it should be fed either rolled or ground. Corn is just as desirable as barley, but is not available in many parts of the State at present. When the above are high in price, oats will do, but is rather too bulky to be as valuable to hogs as either barley or corn. Skim milk is valuable for hogs at any age, but is most economical when not more than three or four pounds is fed for each pound of grain. If pasture is not available some concentrate high in protein, such as tankage, should be fed with the grain.

The rate of gain made by a pig quite naturally varies with his breeding and age. Henry found at the Wisconsin Station that the rate of gain of pigs from birth was as follows:

| Age | Average Gain Lbs. | Per cent Gain |
|---|---|---|
| First week | 1.9 | 76 |
| Second | 2.6 | 59 |
| Third | 2.8 | 40 |
| Fourth | 2.7 | 28 |
| Fifth | 3.1 | 25 |
| Sixth | 3.0 | 19 |
| Seventh | 4.0 | 22 |
| Eighth | 5.2 | 23 |
| Ninth | 5.3 | 19 |
| Tenth | 5.4 | 16 |

He further shows that the older the hog the smaller the per cent of gain by the following table:

| Average Weight | Per cent of Gain |
|---|---|
| 78 | 7.4 |
| 128 | 6.0 |
| 174 | 5.0 |
| 226 | 4.1 |
| 271 | 3.8 |
| 320 | 3.1 |

A well-bred Poland China pig at five months should weigh 100 to 120 pounds, provided he has been well cared for and properly fed.

### Moldy Corn for Hogs.

*Will it hurt hogs to feed them corn that has been piled over a place where horses have stood and got slightly moldy and sweated in the fodder?*

Swine are less particular about the condition of their feed than any of the other farm animals, and it might not hurt them to eat slightly moldy corn if it is not fed too heavily. The safer plan, however, is to steam the corn before feeding it, or to scald it with boiling hot water, if the inquirer refers to the grain, and in case fodder is meant, to chop it fine and then treat it in the manner stated. In the latter case the feed will be greatly improved in both palatability and feeding value by the addition of some cane molasses.—F. W. W.

### Cocoanut Meal for Swine.

*What value has cocoanut cake or meal as a feed for brood sows and growing pigs? How can I make a balanced ration with it in conjunction with barley and cooked potatoes?*

Cocoanut meal is mostly used for feeding cows in this country, but it also makes a good swine feed when mixed with grain, or mill feeds, although these animals do not relish it quite as well as do other farm stock. It is of a medium protein content and high in fat, containing on the average about twenty per cent protein and eight to ten per cent fat, with a fiber content below ten per cent. It has the drawback that it turns rancid readily and is not palatable to stock when in this condition. It is preferably fed in mixtures with other concentrates. If either skim milk, alfalfa meal, or alfalfa pasture is available, a mixture of barley and cocoanut meal, equal parts by weight, or in the proportion of 2:1 will give satisfactory results, fed with potatoes, to brood sows and growing pigs. If neither skim milk nor alfalfa is available, some other high-protein feed must be added in order to balance the ration, and tankage is best adapted for this purpose. This may be included in the ration to the extent of ten per cent of the grain feed; if mixed with the barley and cocoanut meal in the proportion given, this will make a very palatable ration for sows and growing pigs.—F. W. W.

### Hogs on Barley Alone.

*I have read that hogs fed entirely on barley had made gains of* 100 *pounds for each* 418 *pounds fed. Is that correct? Can young pigs be successfully raised on a ration composed entirely of barley from the time that they are weaned? We have no alfalfa.*

Approximately 425 pounds of barley are necessary for 100 pounds of gain on hogs from weaning time up to market weight. The last hundred pounds up to this time will undoubtedly take more grain than this, if nothing but the grain is fed, but the earlier gains are enough more economical to keep the average down to that amount. Whether or not it is profitable to raise pigs in a small pen, fed on

barley alone, will depend pretty much on the price of barley. If the above amount cost as much as one and one-half cents per pound, at the average prices of hogs, there would be little or no profit. It is much more economical if some green feed can be fed in addition. In an experiment where for one lot of hogs we cut the alfalfa green and brought it to them, while the others were allowed to run on pasture, the gains were practically the same and the amount of grain was exactly the same. This would rather indicate that for market hogs, practically as cheap gains can be made by cutting the green feed and bringing it to them. This green feed does not necessarily need to be alfalfa, but might be vetch, rape, field peas, or some similar food.

We begin feeding some barley with equal parts of shorts as soon as the pigs are old enough to eat. A pig after weaning can oftentimes eat as much as five per cent of his body weight in grain. This would mean that a fifty-pound pig would consume about two and a half pounds per day. A pig weighing 200 pounds or more is not liable to eat over two per cent of his weight daily for a long period, although pigs of this weight can oftentimes eat six or six and a half pounds of barley per day if nothing else is fed in addition.—Prof. J. I. Thompson, University Farm.

### Hogging-Off Emmer.

*I have about two acres in emmer. I do not think it will make good hay on account of the strong beards it has. Would it be advisable to build a fence around it and turn the hogs in and let them thresh it out?*

Yes; it would probably be the best use you could make of it. As a feed grain for all kinds of animals emmer is much inferior to barley, corn and sorghum. It can, however, be profitably mixed with them and much better results attained than by feeding it alone. It also works well fed with alfalfa. Emmer is hardy and productive under drouth—and that is about the best that can be said of it.

### Tomatoes for Hogs.

*Is there any food value in tomatoes? If any, how much? Do they make good hog feed?*

Tomatoes are doubtless fed occasionally to hogs, but I know of no case where they have been fed in large amounts or for a considerable period of time. They contain about 95 per cent of water, or only one-half as much solid materials as skim milk or buttermilk. The dry matter of tomatoes consists largely of different kinds of sugar, with some protein substances, organic acids (mainly citric acid), and mineral matter. On account of the great dilution in which these feed materials occur in tomatoes, and the relatively high acidity content of these, they should only be fed sparingly, along with dry roughage and grain. Fed under such conditions, there is every reason to believe that they will prove valuable for feeding hogs and will add to the palatability and nutritive effects of the rations.—F. W. W.

### Spineless Cactus for Hogs.

*In regard to spineless cactus as a hog feed, what is the proper way to feed it? And what else should be given with it to make a good ration? Has it any fattening value? The variety I have has some spines. Is it safe to feed these? Or should they be scraped off?*

The slabs of spineless cactus may be fed to hogs either whole or chopped and mixed with grain, say two to three pounds of barley per hundredweight of hog. It is well relished by both cattle and hogs and has a certain feeding value, but it is a very watery feed, containing only ten to fifteen per cent of dry matter, and cannot, therefore, be depended upon to furnish the main part of the ration, especially in the case of hogs, as the stomachs of these animals do not have sufficient capacity to enable them to take care of large quantities of bulky feeds. One hundred pounds of spineless cactus contains less than one pound of digestible protein and about eight to twelve pounds of digestible carbohydrates and fat, depending on the age of the slabs. Remove the spines so as to guard against the hogs getting sore mouths.—F. W. W.

### Hogs for Fruit: Not Fruit for Hogs.

*I am thinking of buying twenty acres of unprofitable vineyard and starting in with hogs. As the vines go I could supplement pasture and raise my own feed, and keep more hogs. In your opinion would it pay to feed three and a half cent raisins to hogs? How many hogs could I keep on twenty acres providing I pull up some of the vines and supply them with the necessary pasture?*

We cannot tell how many hogs you can keep on land which is shifting from one crop to another and probably both of them poor. But we can safely say that we would not for a moment think of growing fruit to feed hogs; they will save wasting of fruit, but they cannot justify growing fruit primarily for their use. Fruit, especially when dried, makes good hog feed, if wisely fed in connection with other feeds, but does not give high value to it. Four pounds of ripe grapes are equal to one pound of barley, and one pound of raisins is equivalent to one pound of barley; so the hogs might return you one and a quarter cents for your raisins, at the present price of good feed barley. If you wish to grow fruit it will pay to keep some hogs on other land and let them save waste fruit with the alfalfa and grain you grow for them. If you wish to grow hogs, clear off the failing vines and grow alfalfa, Kaffir corn or barley, or else get some good land which does not have to be cleared of unprofitable vineyard.

### Milk for Hogs.

*Which kind of milk, sour or sweet, should be fed to hogs, and do they derive more good from the sour milk; also, is it safe to feed the first milk, after a cow calves, to hogs?*

The difference in the results obtained from feeding sweet milk and sour is so small that not much can be claimed in favor of one over the other. It is oftentimes difficult to so arrange the supply of milk that it can always be fed sweet, and for that reason it is advisable

in many instances to feed it sour. The cow's first milk or colostrum is not apt to be harmful to hogs in the quantities that any ordinary dairyman would have. The objection to its use is its richness, which might cause a disarrangement of the system if fed continually.

### Purchased Feed for Pigs.

*How many hogs can be kept on an acre of alfalfa? Is there any money to be made on hogs where one has to buy all they consume?*

The number of hogs that you can raise on an acre of alfalfa will vary according to the fertility of your soil and the size of the hogs. With sizes ranging from 50 to 150 pounds you should be able to keep from 15 to 20 head, providing, of course, that you have good average yields of alfalfa. While it would be possible to raise them on alfalfa alone it would be a great deal more profitable to also feed some grain and skim milk in addition to realize the most from the alfalfa. The best ration to feed in connection with alfalfa pasture is one-third rolled barley and two-thirds skim milk, soaked and fed night and morning. By feeding in this manner you would very likely be able to keep more to the acre than above mentioned. If you are able to purchase skim milk, or buttermilk, and have an alfalfa pasture, you could by purchasing barley be able to realize a profit from hogs, but without the alfalfa or other good forage, the undertaking would be doubtful, unless carried on in a very small way for home pork, where only one or two sows were kept and the scraps and wastes from the place would add enough cheap feed to make the pork cost less than its market value.

### Feeding Smutty Barley.

*What effect will barley that has quite a little smut in it, so that when it is soaked it makes the water quite dark colored, have on hogs?*

The smutty grain will not be quite so nutritious as clean grain, but you will be safe in feeding it to hogs. This is a general practice among grain growers as the most profitable way of disposing of smutty barley.

### Feed for Milk Goats.

*What is the best feed to increase the flow of milk goats?*

George Langnois of Sebastopol has found the following ration most satisfactory in feeding milk goats: ½ pint rolled oats or rolled wheat, ½ pint of dried beet pulp and ½ pint of bran, together with all of the alfalfa hay that they will eat. With goats as with all other kinds of milk-producing animals, the better the feed the larger the milk flow will probably be and while the above ration may be of higher quality than necessary, Mr. Langnois says that he finds it profitable.

### Sweet Clovers for Hogs and Sheep.

*How is sweet clover as pasture for hogs or sheep? How about its value as compared with alfalfa? Also, which is the better variety—white or yellow?*

For forage purposes white sweet clover is the one to grow, because the root lives two years instead of one year, and the flavor is less objectionable to stock. In nutritive qualities white sweet clover resembles alfalfa, but animals have to be taught by hunger to like it. They will not usually eat it if other forage is to be found. But there are stock feeders who speak well of it.

### Danger in Bad Hay.

*Water backed into our barn some time ago and wet about an inch of the bottom bales of a large quantity of hay stored therein. In most places the hay is moldy to a depth of two or three inches, the remainder being pure and sweet. We would like to know whether it will hurt to feed this hay to stock without separating the damaged from the good? I am told that it will not injure cows, that they will pick over it and leave the damaged hay.*

Bad hay is dangerous, especially so to horses, but never fully safe for anything. We would never feed it to animals we thought much of. Cattle are in less danger and the common practice is to work off doubtful stuff on dry stock. There is, however, always some risk in feeding bad stuff. The best use for it is for plowing under as manure.

### Feeding Beets and Corn.

*What are the relative feeding values of corn and sugar beets, half sugar and half mangel?*

It is understood that the inquiry refers to the grain of Indian corn and not to corn fodder or green corn. In so far as two feeds of such different character as sugar beets and corn can be compared, I would say that it would take about 6 to 7 tons of sugar beets to equal a ton of corn or other cereals (except oats) in feeding value. If it is intended, for instance, to partly replace corn in a mixed ration with beets, the production will not be affected appreciably when the substitution is made in the ratio of 1:6 by weight. This has been thoroughly tried out in a large number of feeding experiments and is in accord with our general knowledge of the contents of valuable nutrients in these feeds. The different varieties of mangels vary greatly in their content of dry matter; some contain nearly as much dry substance as sugar beets, while others contain only one-half as much. The average water-content of half-sugar mangels appears to be about 87 per cent, while good sugar beets will contain 80 to 85 per cent of water (15 to 20 per cent of dry substance).—F. W. W.

### Root Crops as Stock Foods.

*What is the food value of mangel wurtzel and sugar beets as a stock food? What do they generally yield to the acre on good loamy soil? Are either injurious if fed to brood sows?*

Both mangels and sugar beets make valuable stock foods. The former roots contain only a little more than one-half the quantities of

nutrients found in sugar beets, and it requires about 12½ pounds of mangels and 7 pounds of sugar beets to equal a pound of grain (barley, rye, wheat, etc.) in feeding value. At $32.00 per ton for grain, a ton of mangels would, therefore, be worth about $2.60, and a ton of sugar beets $4.60. On good loamy soils and under good cultivation mangels will yield 20 to 30 tons, or more, per acre, and sugar beets 12 to 15 tons, so that the total amounts of nutrients obtained from an acre of mangels or sugar beets do not, as a rule, differ greatly. Both crops make excellent feeds for brood sows and other hogs, as in fact for other farm animals. They are generally run through a root cutter, or sliced before being fed out.—F. W. W.

### Feeding Value of Stock Beets.

*What is the feeding value per ton of stock beets for dairy cows?*

It is fair to assume that 8 to 12 tons of stock beets are worth as much as a ton of grain for stock feeding. The wide variation in feeding value is due to the varying water-contents of the different varieties of beets. These range from 85 per cent to over 90 per cent, or 10 per cent to 15 per cent of dry matter. In northern Europe, especially Denmark, where heavy feeding of roots to dairy cows is a common practice, analyses of the root crops grown are frequently made, in order that the farmer may know definitely the actual feeding value of his crops and thus plan his feeding operations intelligently. We have not gotten that far in this country as yet, and to most of us "roots is roots." On the average it may be said that root crops will have a value of about one-tenth that of barley, weight for weight, for feeding farm animals, especially cattle and sheep. Their special merit for feeding purposes lies in furnishing succulence in the rations and a supply of highly digestible and palatable nutrients. They are valuable stock feeds, both on account of the feed components they furnish and as appetizers; animals fed considerable roots are able to eat heavy rations, containing large amounts of concentrates, without going "off feed."—F. W. W.

### Stock Beets and Alfalfa Hay.

*Do you advise the feeding of stock beets to dairy cows in connection with alfalfa hay? Some dairymen say it is more profitable to feed chopped stock beets with alfalfa hay than to feed silage with alfalfa hay.*

Stock beets make a good supplementary feed for dairy cows on alfalfa hay. They are rather low in feed materials, containing 10 to 12 per cent of dry matter, or only one-half to one-third as much as Indian corn or sorghum, at the stage of growth when this is cut for the silo. To offset the low dry-matter content, roots generally yield heavily; viz., 20 to 30 tons, or more, per acre on rich land, and they have a high digestibility and are greatly relished by dairy cows and other farm animals. Silage, however, has special points in its favor, and even if larger or cheaper crops of beets can be grown, many farmers will prefer to grow Indian corn or sorghum for silage, so as to have a uniform readily available succulent feed for dairy cows throughout the winter, when it is often

difficult to get on to the fields to haul the beets. Beets may be fed to dairy cows in considerable quantities, if desired. European farmers and some Eastern farmers feed 100 pounds of beets or more, per head daily to cows on official tests for maximum milk production, without regard to the expense involved. Under ordinary farm conditions it will not be advisable, however, to feed much more than one-half this amount to dairy cows supplementary to alfalfa hay. A ration of 20 pounds of alfalfa hay and 60 pounds of beet per head daily will contain about 20 pounds of dry matter, 2.7 pounds digestible protein and 11.9 pounds digestible carbohydrates and fat, which is about right for cows of average production. If a few pounds of grain be added to the ration this would be still further improved.—F. W. W.

### Watermelons for Milch Cows.

*What is the real value of watermelons and pie melons for feed for milk cows? Will they dry them up or leave any bad effects?*

Watermelons contain about ninety per cent of water and only ten per cent of dry matter, hence they are of but limited value for stock feeding and must be supplemented by considerable dry feed, at least hay, corn stalks, straw, etc. In case of the latter being fed, grain feeds high in protein must also be supplied to obtain satisfactory results. The farmer who depends to a large extent on watermelons and similar feeds to supply nourishment to the cows for body maintenance and the production of milk will find that the cows will dry up earlier than good dairy cows should. The same would apply to the feeding of piemelons, but fed in a commonsense way, along with dry roughage and grain, both vegetables will furnish very satisfactory additions to the rations fed and will enable cows to maintain a maximum flow of milk for a normal lactation period. The facts that these vegetables contain only about five to ten pounds of dry matter in 100 pounds and that dairy cows require 20 to 25 pounds of dry matter for an average production, suggest that it is impossible for a cow to eat sufficient quantities of them to obtain the necessary nutrients and that her production is bound to decrease abnormally if she had to depend only, or even largely, on these vegetables for her sustenance.—F. W. W.

### Milo Maize Good Feed.

*I am told that milo maize will dry up a milch cow. Have been feeding fodder with heads; also feeding my horses same with alfalfa hay. Is there any danger in feeding horses? And will it dry up cows? One neighbor says he has lost 50 hens from feeding it; also has a sick hog.*

There is no evidence that milo maize, properly fed, will dry up milch cows any more than barley will do it. On the contrary, it is certain that it is good feed for cows, horses and sheep if fed in sufficient amounts, and along with some feed or feeds high in protein, either hay or concentrates. The apprehension may be explained by experience in feeding milo maize in place of alfalfa and finding that it falls

short in feeding value. This is only what one would expect. Milo forage contains 1.9 per cent digestible protein and 42.6 per cent digestible carbohydrates and fat, against 10.4 per cent and 38.2 per cent, respectively, for alfalfa hay. But milo furnishes valuable fodder for milch cows, and is fed extensively to dairy stock. Being low in protein it must, however, be supplemented with feeds that contain a considerable proportion of these substances; otherwise the cows will not receive sufficient protein for body maintenance and the production of the largest amount of milk of which they are capable. A diminution in the milk flow will be likely to result in that case and possibly a shortening of the lactation period. The cheapest supplementary feed in this State would be alfalfa hay, but if this is not available, grain mixtures containing high-protein feeds like mill feeds, cottonseed meal, or oil meal, must be supplied. Even with alfalfa it will be well to add some grain feed to the ration in the case of high-producing cows; while for milch cows of average productive capacity, the milo heads will furnish sufficient grain fed with milo forage and alfalfa. I would suggest the following grain ration to be fed with milo where no alfalfa is available: A mixture of wheat bran and cottonseed meal in the proportion of 2:1 by weight; or one of barley, wheat, bran and cottonseed meal, equal parts by weight, one pound of the mixture being fed for every 5 pounds of milk which the cows produce.

There is no danger in feeding horses milo heads or milo forage, nor will the feeding of milo cause sickness or death of hens or hogs. The cause of the trouble which the correspondent reports must be sought in some other factor than the feeding of milo, unless this was moldy and unfit for feeding to stock.—F. W. W.

### Pasturing Sorghum.

*You say that second growth sorghum contains prussic acid. I have been experimenting this year with sorghum, milo maize and Kaffir and Egyptian corn, and expected to plant quite largely, especially of the sorghum next year. I cut the first crop and cured it for hay, then expected to pasture the second crop. This is grown without irrigation, consequently makes a slow growth. Would it be safe to pasture this if kept fed down close? And do all of these feeds contain the prussic acid?*

All the plants you mention are sorghums and they are all apt to develop prussic acid under conditions favoring it—but, as a matter of fact, they rather seldom do it. For this reason much use is safely made of such growth as you plan to do. One can only tell by analysis near the field whether the stuff is safe or not, because if cut and sent to a distant laboratory, the poison could disappear. The practical test is to turn a small-value animal into the feed for a day or two and determine safety in that way for the rest of the stock.

### Sorghum for Soiling.

*Is sorghum (Egyptian, Kaffir, etc.) valuable for succulent feed for cows in summer, cut and fed green? How many times can same field*

*be cut? Is it safe? Our land is not ready for alfalfa and we want something to take its place for green feed.*

In the interior valleys, colonists are regularly substituting sorghum for alfalfa for quite a while, but it needs alfalfa as soon as possible to balance the ration. Sorghum was used in connection with alfalfa hay and proved an excellent feed. If it is allowed to wilt before feeding there is no danger from poisoning, and for this reason it is better to cut and haul in as you suggest. If you have water for irrigation it will keep growing all summer and fall and furnish green feed the entire time but it depends upon the care and soil how many times you can cut it, also upon how high you let it grow before cutting. Frost will end it.

### Sorghum Stover.

*Are milo maize stalks harmful to cows after all of the grain has been taken off except the secondary small heads with small amount of grain on them? Will it pay to cut them and feed with alfalfa hay or let the stock clean up what they will in the field?*

Sorghum stalks are not injurious unless eaten in excess, when they are apt to cause indigestion, as other coarse fodders sometimes do. There is no poison in them as there is sometimes in rank green sorghum. Sorghum stalks are sometimes siloed after the grain heads are gathered because sorghum has the habit of holding juice in the stem longer than Indian corn, which is generally counted not fit for siloing after the ears ripen. In siloing sorghum stalks it is desirable to use some water in filling and pack down very tightly.

### Egyptian Corn or Barley?

*Which is better to fatten hogs—Egyptian corn, or barley when soaked in skim milk?*

Egyptian corn contains about 8 per cent digestible protein and 71 per cent digestible carbohydrates and fat, while the corresponding figures for barley are 9.4 per cent and 75.9 per cent, respectively. Barley is, therefore, a somewhat more valuable feed than Egyptian corn. Practical feeding experiments with hogs have shown that the latter possesses about 10 per cent lower feeding value than Indian corn or other cereals. This figure will doubtless be found approximately correct for the comparison of the value of the two grains for fattening purposes. Like all small grains, Egyptian corn should be ground or soaked in skim milk or water for feeding to hogs or calves, and should be ground when fed to mature animals.—F. W. W.

### Fodder and Molasses.

*What is the feeding value of gyp corn fodder for dairy cattle when chopped up and mixed with cane molasses?*

Egyptian corn (white or brown Durra, correctly speaking only the latter) makes a valuable grain and forage plant of nearly similar feed-

ing value as barley. The stalks do not differ greatly in chemical composition from Indian corn stover, which contains about one-third of the nutritive substances present in the entire plant. It is probably not much out of the way to assume that Egyptian corn fodder chopped and mixed with one-fourth or one-third its weight of cane molasses will make as valuable feed as a fair quality of grain hay, and will prove especially adapted for feeding dairy cows, wintering stock and idle horses.—F. W. W.

### Cutting Corn for Forage.

*When is the best time to cut field corn to make the best fodder?*

As shown by experience and determined by analyses the whole plant is in richest condition just when the kernels are glazing—that is, in the condition for roasting ears.

### Buckwheat for Feed and Fertilizer.

*In growing buckwheat for bees can I cut it when mature and let the chickens thresh it out themselves? Will it make a good chicken feed? I am also informed that the straw plowed under makes an excellent fertilizer. Can this straw be used for stock feed?*

Buckwheat straw is eaten by stock, but is no better, if as good as other straw. Chickens will help themselves to the grain when they know it. It should not, however, be made their sole feed. The straw handles well as a fertilizer because it rots very readily. The green plant plowed under is a good source of humus.

### Barley Straw and Alfalfa Hay for Steers.

*How much barley straw and alfalfa hay—half and half—will it take to feed a "short yearling" beef steer for six months? What gain in weight could I expect? Would it pay to feed a small amount of grain?*

The amount of half-and-half would depend on how much straw the steer can consume in addition to alfalfa hay. If the correspondent is bound to feed equal parts of the straw and hay, the steer would not get sufficient nutriment to make satisfactory gains even if some grain is fed. If he is anxious to feed as much straw as possible, give, say, 6 pounds per head daily and feed alfalfa hay ad libitum, of which the steer will then eat somewhere around 15 to 20 pounds daily. I would not expect very large gains even on this ration unless some grain is fed, say at least 2 to 4 pounds per head. With the latter amount of grain and roughage as suggested, good yearlings would probably make a gain of one and one-half to two pounds per head daily on an average for the six months.—F. W. W.

### Relative Value of Wheat and Wheat Middlings.

*What is the food value of whole wheat ground as fine as possible with the ordinary farm mills for milch cows, hogs and chickens, as*

*compared with middlings? Wheat and middlings are about the same price here.*

Wheat contains about 8.8 per cent digestible protein and 70.9 per cent digestible carbohydrates and fat, while the corresponding figures for wheat middlings are 13.0 and 55.6 per cent. We should expect, therefore, that wheat would have a somewhat higher feeding value than middlings, but the latter has the advantage in furnishing about 4 pounds more digestible protein (muscle-forming substances) per 100 pounds than wheat. This would be of importance in feeding a ration rather low in protein but not when, for instance, alfalfa is fed as this furnishes an ample supply of these substances. We may say, in general, that wheat is of greater value for fattening animals than middlings, while the latter would be somewhat more valuable in the case of growing and milk-producing animals, unless the ration fed already contains sufficient protein to meet the needs of these animals. Better results will, however, doubtless be obtained by feeding a mixture of wheat and middlings, or some other concentrates, than either separately.—F. W. W.

### Feeding Value of Garbanzos.

*What is the feeding value of garbanzos as compared with other grains?*

Garbanzos or chick peas are considerably richer in digestible protein and fat but contain less carbohydrates than the grains as shown in the analyses below, which are taken from University of California Bulletin 164. The actual fat, protein and carbohydrates are considerably greater.

| Kind | Per cent Digestible. | | |
|---|---|---|---|
| | Protein | Carbohydrates | Fat |
| Black-eyes | 16.50 | 51.22 | 1.65 |
| Large horse beans | 19.33 | 45.72 | 0.98 |
| Garbanzos | 18.38 | 46.00 | 3.25 |
| Small horse beans | 13.16 | 52.50 | 0.95 |
| Plump wheat | 9.20 | 61.1 | 1.20 |
| Rice | 5.30 | 67.6 | 0.30 |
| Barley | 8.75 | 64.3 | 1.75 |

When beans are fed, something high in carbohydrates is needed. It is interesting to note that A. B. Humphrey of Mayhews, one of the heaviest winners at the Exposition, fed his hogs on boiled beans, barley and milk.—Geo. H. Croley.

### No Appetite for Cow Peas.

*I planted cow peas called "New Era," and advertised to be a good forage crop. The vines grew well and matured a heavy crop of beans, but my stock won't eat them. Hogs and cattle have been running on barley and barley stubble and passing these cow peas every day from the time they were quite young until now when the pods are ripe, and have never touched either vine or pod. I am disappointed as I wanted a leguminous forage to use in rotation with barley.*

The trouble is in the hogs, not in the peas, for the New Era, like other varieties, has a good record for stock feeding. Your stock is of the stand-pat party; try sprinkling a little bran and see if the aroma of it will not give them more appetite. Cow peas are successfully grazed both green and dry and the manure and roots are just what you need to make more barley later.

### Bean Hay.

*My white beans made abundant vines, but no beans. I have cut the vines and they are now cured. I have been feeding them to my horses. They eat them fully as readily as alfalfa hay. Will the horses do well on them? Could they work as usual on that kind of hay?*

Surely. Bean hay resembles alfalfa hay in composition and is more nutritious and digestible than bean straw, which is also good. It carries the stuff for work. The nutrients will be balanced by feeding a little grain with the bean hay, and it will probably give the horses a little more zip. Of course, you will watch the condition of the horses and act accordingly.

### Value of Lima Bean Straw for Stock.

*What is the real value of lima bean straw as a feed for stock? Also its fertilizer value when returned to the soil?*

Lima bean straw is a valuable feeding stuff for farm animals, especially cattle and sheep. The relatively high price which it commands and the demand for it in the southern part of the State, where it is obtained in large quantities in the lima bean districts, are evidence of the high opinion in which it is held by farmers. Comparing it with other dry roughage, it has nearly a similar feeding value as grain hay, and is fully equal to stock hay. An average grade of lima bean straw contains about 5.4 pounds digestible protein and 41.5 per cent digestible carbohydrates and fat. The ratio between the flesh-forming and starchy components is, therefore, 1:7.7, showing that this straw belongs to the class of medium-protein feeds, and in order to secure best results it should be supplemented with some alfalfa hay or grain mixtures containing at least a small proportion of high-protein feeds, like cottonseed meal or linseed meal. Lima bean straw contains the following percentages of valuable fertilizing ingredients per 1,000 pounds: 17 pounds nitrogen, 4 pounds phosphoric acid; 14 pounds potash. At ordinary market prices for these ingredients the straw would have a fertilizer value of about $4.50 per ton.—F. W. W.

### Black-Eye Bean Straw for Sheep.

*What is the value of black-eye bean straw for feeding sheep? Will sheep do well on it alone if they have plenty of it?*

Bean straw is quite a good sheep feed, especially if the beans are cut before the straw is thoroughly dried. It makes good feed to winter sheep on. However, a little hay should be added if the straw is very coarse. In analysis bean straw corresponds very closely to pea straw, the latter being fed very extensively to sheep throughout the pea-growing section.—R. F. Miller, University Farm.

### What Is Tankage?

*We have read in your paper about people feeding tankage and would like to know the meaning of the word.*

Tankage is a by-product of large meat-packing establishments and is made of scraps and trimmings from meat and fat, hair and other residue from the plant. After cooking or steaming for several hours in pressure tanks, all existing disease germs are destroyed, the grease being drawn off and the greater part of the moisture either pressed out or evaporated. After processing it resembles dark wheat shorts and is usually sold in 100-pound sacks. Packers maintain that it will keep indefinitely under fairly good storage conditions. It is used chiefly as a substitute for skim milk, it being especially recommended for young pigs. It is generally about fifty per cent protein, and contains about twice the food value of oil meal if not fed as more than ten per cent of the ration. Such concentrated feed must not be given in too large quantities.

### Storing Rolled Barley.

*How long can rolled barley be safely stored and what is the best way to store it?*

Rolled barley is usually stored in sacks ready for shipment, while whole barley is often stored in bins in bulk. Rolled barley absorbs moisture much more easily than whole barley, and so must be stored to prevent collection of moisture and development of mold and heat. When rolled barley leaves the mill, it is hot and must be cooled off before storing closely. The best way is to stand the sacks on end with space for circulation of air until thoroughly cool. Then if stored in a dry place where moisture cannot come up from underneath, it may be safely piled four or five sacks high, standing the sacks on end in winter time, leaving space between the stacks for circulation. In summer, if dry and cool before storing, it can be piled higher and closer together. Too much weight on the lower sacks if they are damp would pack them and have greater tendency to make them spoil.

### Meal Mite in Crushed Barley.

*I am sending a package of "lice" and barley, taken out of our barley granary. This barley was bought in San Francisco and supposed to be clean and steam rolled. Two of the other granaries had not as yet become "alive." Please tell me what these are and what is the remedy.*

The crushed barley is infested with the meal mite or acarus. The stuff would not be dangerous for feeding hogs or fowls and probably would not injure other animals. Any crushed grain would be likely to be infested by this minute insect if stored after crushing. Thorough cleaning of the granaries and whitewashing, with a good spray which would shoot the cracks full, ought to reduce it to a minimum, but it is always dangerous to store crushed grain for long.

### Dried Prunes for Cows.

*My cow is very fond of dried prunes. Will they cause her any injury if fed with the seeds? She will greedily eat several gallons at a time. Am having success feeding them to pigs.*

So far as I have been able to ascertain, the pits do not cause any trouble when dried prunes are eaten by cows or hogs. According to Professor Jaffa, 100 pounds of this fruit has a similar feeding value to about 85 pounds of barley or oats. Being high in sugar (nutritive ratio 1 : 16.7), they are preferably fed with grain or mill feeds and alfalfa hay in order that sufficient protein be furnished in the ration to meet the requirements of the animals for growth or production, or both.—F. W. W.

### Grapes for Horses.

*When Tokay grape packing begins we have lots of culls that will run about 20 per cent sugar. Horses are very fond of these culls and will eat fifty or sixty pounds each per day. They will leave first class alfalfa hay for these culls. The only effect I can see is a slight loosening of the bowels, and they probably won't eat quite so many hard stems among the hay when they have all the culls they want. Some people say they are not good for horses, and that they will ruin the enamel on the teeth.*

Grapes and grape pomace are occasionally used for feeding farm animals, especially hogs and horses, and those who have had experience with them report in the same way as the correspondent in regard to their palatability and apparent feeding value. The stems and skins contain a good deal of tannic acid, which is an undesirable constituent in a feed, and considerable amounts of tartaric acid are also found in grapes and grape residues. The tendency to scouring referred to is doubtless partly due to the presence of the latter of these constituents and partly to the mechanical effect. On both accounts it is necessary to feed these products rather carefully, in moderate amounts only, and always in connection with dry forage, but aside from this difficulty there is no reason to believe that the feeding of either grapes or grape pomace will prove injurious. There is probably no more to the fear that they will ruin the enamel on the teeth of horses than that silage will ruin the teeth of cattle which we hear stated now and then, and still silos are going up in increasing numbers every year, and as farmers get experience in feeding silage, they forget all about the disastrous results that they are warned may come from its use. The reason is that these results are either imaginary, or farmers learn to use the feed in such a manner that no injurious results occur. There is, of course, much less accurate information as to the feeding of grape and fruit by-products to farm animals than as to the effect of silage, but we are doubtless safe in stating that with the precautions suggested they may be safely fed to farm animals when market conditions render it desirable to do so.—F. W. W.

### Feeding Value of Rice Straw.

*Advise me as to the value of rice straw as feed? Some tell me it is very good and some that it is injurious. One man told me that it causes constipation in horses, and another that it has the opposite effect. My own experience with it consists of offering it to one cow, which declined to eat it, and two horses that seemed rather fond of it.*

Rice straw cannot be compared with alfalfa hay in feeding value, however, for it contains only a trace of digestible protein (.9 per cent), against over 10 per cent for alfalfa hay. The percentage of total digestible matter in the feeds are, 39.4 per cent for rice straw and 48.6 per cent for alfalfa hay. The value of rice straw in comparison with alfalfa hay is doubtless considerably lower than these figures would indicate, for rice straw contains 33.5 per cent of fiber (largely indigestible), against 25 per cent for alfalfa hay, and has also twice as much mineral matter, mainly silica, as contained in alfalfa hay (14.5 per cent, and 7.3 per cent, respectively). For all that it is well worth while to utilize rice straw for feeding farm animals, especially horses and mules. If they have been on alfalfa hay, it may be necessary to get them pretty hungry before they will eat it, or it may be chopped and fed with some molasses or grain feed to get them to eat it. It cannot take the place of alfalfa hay, however, and horses must be fed more grain when fed rice straw than when receiving alfalfa hay, and a feed of this hay or some grain hay daily will also improve the ration fed.

In Hungary rice straw is made into silage by being placed in large piles in the fields that are covered with a layer of dirt. The resulting silage makes a succulent feed of a light brown color and a strong acetic-acid odor; it is greatly relished by cattle and when fed in moderate quantities makes a good stock feed. The silo, doubtless, offers the most promising method of securing full value. Good silage can be made from ripe oat straw by running it through a cutter and wetting it down thoroughly as it goes into the silo, and the same method would change rice straw into a desirable roughage feed that would be especially valuable as a supplement to alfalfa for feeding dairy cows.—F. W. W.

### Gains From Siloing Alfalfa.

*Has alfalfa silage proven a success in your State?*

Experience here seems to show that the chief value of a silo for alfalfa lies in the ability to turn the first cutting, which is very often badly infested with fox tail and other objectionable weeds, into succulent feed, fully as nutritious as green pasture, which may be fed out gradually as the demands require. Then too, the dangers of bloating on pasture are entirely overcome, for when cows are fed silage they do not require pasture and silage does not bloat the stock. Where corn or any of the sorghums can be grown, it is probably best to silo the first crop of alfalfa and by the time the corn is ripe enough

to silo, your first filling will have been fed out. The opinion is becoming more general, however, that even if corn cannot be grown, a silo will pay the alfalfa grower who has live stock, on account of the benefits above recited.

### Oats and Barley for Silo.

*Can I silo a mixed crop of red oats and barley, and at what stage of its growth would it make the best ensilage? Would it make a palatable feed for milch cows?*

A good quality of silage may be made from the cereals by cutting the grain when the kernels are past the milk stage. The green grain is run through a feed-cutter with the least possible delay, and cut into inch or inch and a half lengths, the cut mass being elevated into the silo by means of a blower and carefully distributed and tramped down in the silo, especially along the wall. A cement tamper is a convenient aid in packing the green mass in the silo so that the air is excluded so far as practicable, which is a most important part in the making of silage. If the cutting of the grain is delayed till towards maturity very satisfactory silage can also be secured by adding considerable water, either in the blower as the cut mass is elevated into the silo, or in the silo itself, after each load. The mass should be wet down so that it will contain approximately the amount of water found in the grain at the time the kernels are in the milk stage. Both oats and barley, as well as a mixed crop of these grains, siloed in the manner stated, will make a good quality of silage of a light brownish color and pleasantly acidulated odor, which will be greatly relished by cattle and other farm animals; twenty to twenty-five pounds is an average feed per day for dairy cows or fattening steers. With modern tall silos there is no difficulty in making good silage from the small grains that are run through a cutter and packed well in the silo, as suggested.—F. W. W.

### Size and Capacity of Silos.

*I expect to build a silo and would like to know the size best suited to my needs. I have 25 cows at present and will increase to 50 or 60. I will put in first cutting alfalfa then refill with corn. What kind of corn is best, and how many acres should I plant?*

It is impossible to state the exact size of a silo to be constructed for a given number of cows as variation in the size of the animals will determine whether each cow is to receive 24, 30 or 40 pounds daily. It is better to have the diameter of the silo small enough to make possible the feeding of about two inches from all over the top each day, as this keeps the top of the silage from drying out and molding. In the following table it is assumed that each cow will consume thirty pounds of silage daily, but in building your silo you should add about five feet to the height to allow for settling, as the following figures are based on actual measurements of the silage after settling has taken place.

| No. of Cows | Silage for 180 days at 30 lbs. per day | Acres of Corn at 12 tons per acre | Size of Silo. Inside Diameter | Depth of Silage |
|---|---|---|---|---|
| 14 | 38 | 3 | 10 | 26 |
| 15 | 40 | 3½ | 10 | 28 |
| 20 | 54 | 4½ | 12 | 26 |
| 25 | 68 | 5¾ | 14 | 26 |
| 30 | 81 | 6¾ | 14 | 28 |
| 35 | 95 | 8 | 16 | 26 |
| 40 | 108 | 9 | 16 | 28 |
| 45 | 122 | 10¼ | 18 | 26 |
| 50 | 136 | 11¼ | 20 | 26 |

In the above table we have figured twelve tons of corn to the acre, which is a good average yield of silage corn in this State. It would be well, however, to plant somewhat more to provide against underestimating and other factors which may cause your crop to be below normal. With twenty-five cows at present, we should advise the erection of a silo 14x28 feet, which would furnish feed for thirty cows for six months. When your herd increases to a point where such a silo is too small you could erect another one alongside of it, the same size and thus provide for the sixty head which you contemplate keeping. No one knows yet which is the best corn for this State and probably there will never be any one best for all parts of the State. For the purpose of siloing it is immaterial which variety you use so long as that variety grows best in your location.

### Silage Always Ready.

*After filling a silo with alfalfa, how long will it be before it is safe to begin feeding the ensilage?*

You can yank it out and feed it the next day if you wish, or any day thereafter.

### Siloing Grain Without Cutting.

*In this locality there are no custom silage cutters, and the initial cost of such equipment is often prohibitive to the small dairyman. Would not the feeding value be as great if green alfalfa or grain was thoroughly tramped in a silo without being chopped?*

We will not say that the stuff cannot be tightly enough packed to make good silage without cutting, but we are safe in saying that it will not be. Even with cutting, it is hard to silo green grain, because the hollow stems enclose too much air. It might be easier to succeed with alfalfa that way than grain.

### Feeding Shorthorns in Winter.

*What is the best ration for beef-strain shorthorns to feed through the winter while pastures are short?*

The simplest and cheapest ration to be fed would be either alfalfa hay alone, or alfalfa hay and some grain feed. The amount of grain to be fed would depend on when the steers are to be marketed

and the relative prices of grain and hay. If they were just to be kept steadily growing, a pound or two of rolled barley per head would be sufficient. In recent experiments at the Pennsylvania Station beef-breeding cows were wintered on a ration of about sixty pounds of corn silage and one pound of cottonseed meal per head daily, on which ration they gained about one and a quarter pounds per day in body weight, on the average for a period of four and a half months. With some pasture it would be possible to winter steers cheaply on a ration like this, or on rolled barley, or barley and hay with a couple of pounds of dried beet pulp. The latter feeds are our cheapest grain feeds at the present time.—F. W. W.

### Ten Sheep or One Cow on Five Tons Alfalfa.

*How much alfalfa hay does the average dairy cow consume in a year without other feed or pasture, and how many sheep could be kept on the same amount of feed under the same conditions?*

A dairy cow fed alfalfa only will eat an average of thirty pounds of hay per day or about five tons of hay in a year. A sheep of medium weight, on the other hand, will eat about three pounds of alfalfa hay daily without grain or pasture. It is generally assumed that ten sheep can be kept on the amount of feed required by one cow.—F. W. W.

### Steers on Alfalfa Pasture.

*Is it true that steers and bulls will not bloat on alfalfa and can be let to run in the fields without danger?*

Any bovine will bloat if he gets too much damp alfalfa in his interior. Bulls and steers are less liable because their appetites are less fierce than cows and they enjoy spending more time in looking at the scenery and doing politics.

### Economy in Chopped Alfalfa Hay.

*Will it pay to chop alfalfa hay when one has silage machinery?*

If you have considerable money tied up in silo filling machinery it is natural to want to use the machinery for some other purpose as much as possible. This is being accomplished very profitably where chopped alfalfa is also used. It is usually found that saving is made through its use as the loss in feeding is a great deal less than when straight hay is fed and the expense of cutting is very little. R. E. Watson, manager of the Rancho Dos Rios near Modesto, has been chopping his hay for over two years and states that he considers the saving to be from fifteen to twenty per cent. Others report that when the whole hay was used the daily waste from the mangers was hauled out each day in a large cart, but since the chopped hay ration has been used this loss has been reduced to the point where only a very small cart load is taken out every other day. Having the machinery on hand the cost of chopping is very small, an eleven-inch cutter being able to cut three-quarters of a ton an hour at a cost of

about fifteen cents an hour for distillate. Two men are needed to operate the cutter, for which an expense of fifty cents an hour should be added, making a total of sixty-five cents for cutting three-quarters of a ton, or about ninety cents a ton.

### Chopped or Ground Alfalfa.

*For the rancher with 30 cows and 100 hogs, who can't afford to buy both, which would be of greater benefit to him, an alfalfa cutter, simply to cut up alfalfa for cows and hogs, or an alfalfa mill to make meal to feed cows and hogs?*

It would not be profitable to invest in machinery as expensive as an alfalfa mill to make meal for so few a number of cattle and swine unless you could run it as a custom mill, doing work for neighboring ranchers. A feed cutter would be more profitable and the results of feeding in this State do not seem to indicate any great improvement in hay that is ground over that which has been run through a cutter and stored in the barn.

### Siloing First Crop Alfalfa.

*Would you advise filling silo with the first cutting of alfalfa to have feed during dry months, and filling later with ensilage corn to feed in winter months?*

I believe thoroughly in the value of the silo for dairy and stock farmers, in general, whether alfalfa, Indian corn or other silage crops are available for silage making, and would advise filling the silo with the first crop of alfalfa. This crop will make a satisfactory silage, even if very weedy, so long as it is cut when the alfalfa is beginning to bloom, before the foxtail ripens. If cut at a later stage many of the hard foxtail heads will be likely to dry out before the silage is eaten by the cows, and may cause trouble. In making alfalfa silage the alfalfa must be run through a cutter and elevated into the silo with the least possible delay after it is mown, so as to prevent drying out, or if delays occur, sufficient water must be added in the blower or the silo during filling to bring the water content up to normal for alfalfa at blooming time. If oats and alfalfa can be well mixed in filling the silo there is no objection to siloing them together; in fact, alfalfa mixed with other green forage, whether weeds, cereal crops, or even straw, often makes silage of a less pronounced flavor than silage from pure alfalfa; doubtless because decomposition products due to the fermentation of the protein compounds are less prominent when the silage crops contain considerable carbohydrate materials like those mentioned. If the alfalfa silage is fed out during summer, the silo may be filled again in October or November with Indian corn, sweet sorghum, or one of the grain sorghums, and a supply of a valuable succulent feed thus secured for winter feeding.—F. W. W.

### Figuring Cost of Alfalfa Silage.

*Would it pay me to buy cut alfalfa and haul it three miles to put in a silo? How much could I pay per ton green if it should be worth*

*$5.00 cured hay? Could I move it fast enough that distance? My silo would be 10x20 or 24. How large a cutter should I use? Is a blower necessary? I have a 5-horsepower engine. Is that enough power?*

It will not pay you when you will have to haul the green alfalfa three miles, and cured hay is worth $5.00 per ton. It will take about four tons of green alfalfa to make a ton of hay, so that at the price given the green alfalfa would cost $1.25 per ton. You can probably not make more than four trips or haul more than eight tons of alfalfa a day, making the expense of hauling the alfalfa about 44 cents per ton, with man and team worth $3.50 per day. This would leave only about 80 cents that you could afford to pay for a ton of green alfalfa. I do not believe that it will be worth while to make alfalfa silage when alfalfa hay can be bought at $5.00 per ton, and would not at any rate recommend the building of so small a silo as 10x20 or 24 feet unless you buy a stave silo. It is hardly practicable to build a resaw silo of smaller diameter than twelve feet, and thirty feet is none too tall for a modern silo; thirty or forty feet would be better. A blower is not necessary, but silos are now generally filled by this method instead of by means of bucket carrier. A five horsepower engine would furnish sufficient power for some makes of silage cutters, but not for others. It is quite an advantage to have ample power in filling silos, as it saves labor and enables the farmer to finish the job with the least possible delay.—F. W. W.

### Alfalfa Meal and Other Ground Feeds.

*What is the relative value of alfalfa meal, as compared with middlings, bran or rolled barley? Would it be better to scald or cook the alfalfa meal, or feed it raw? What would you consider a balanced ration of alfalfa meal mixed with other ground feed or grain and about what amount should be fed for weight of hog?*

We have but little available information as to the chemical composition of the alfalfa meal sold in this State but there is no reason to believe that it differs much from that of alfalfa hay. The grinding of hay does not add anything to its feeding value but merely insures that it is eaten without waste. If alfalfa meal is manufactured from a choice quality of hay it will compare favorably with wheat bran, being worth perhaps a couple of dollars less per ton; but there is alfalfa meal on the market that would not be worth more than one-half this price. During the last season we fed some alfalfa hay in our experiments that contained 14 per cent of protein on the average and 25 per cent of fiber, while another lot averaged only 10 per cent protein and over 29 per cent of fiber. Since wheat bran runs about 15 per cent protein and 10 per cent fiber, it is evident that the nutritive effect of even the best grade of alfalfa hay that we fed last winter would not, if ground into meal, approach that of wheat bran.

The relative value of the feeds given would also depend on the roughage with which they are fed; since alfalfa is high in protein (muscle-forming substances). Feeds relatively high in starchy

components, like rolled barley would be worth more when fed with alfalfa than with grain hay. Assuming that alfalfa or another protein feed, like skim milk, is to be fed with grain feed, the relative values of the feeds given may be considered as follows: barley, middlings, bran, and alfalfa meal.

If fed to hogs, there will be some advantage in wetting the alfalfa meal, but it should not be scalded or cooked, and for other farm animals, it is preferably fed dry mixed with grain feeds—if fed at all.

Alfalfa meal with barley and middlings will make a balanced rations for hogs, as for other farm animals.—F. W. W. (See also of barley, one of middlings, and one of alfalfa meal, by weight. Feed four to five pounds per hundred pounds of live weight. If skim milk is available, less of middlings and alfalfa meal may be fed, but if the feed is made into a slop with water, the mixture given is about right. If alfalfa meal costs almost as much as middlings, or if it does not appear to be of good quality, middlings had better be substituted for it. The market prices of the different feeds will determine the proportion of each that may be used to the best advantage in making up rations for hogs, as for other farm animals.—F. W. W. (See also Part VI, Vol. I.)

### Frosted Corn and the Silo.

*Is it advisable to use frost-bitten corn for silage?*

In his book on "Soiling and Silo Crops," Professor Thomas Shaw of Minnesota says: "When corn is struck with frost and is then allowed to stand for some time, it will be greatly injured for feeding. But if when thus stricken, the crop is at once cut and put into the silo, the value of the silage made from it, though reduced, is not seriously impaired."

### Pit Silos Seldom Desirable.

*I would like to have information regarding underground silos. I am contemplating one about fifteen feet deep and seventeen feet in diameter.*

We have no local data on underground or pit silos as we do not know anyone who has used them in this State. However, we doubt the advisability of constructing such a silo in your location, as experience in the Middle West shows them to be of little value except on high, dry ground, where the rainfall is light and the water level well down. Then too, the slight saving made in their construction over the ground silo is counteracted by the cost of labor in taking the silage out. It is a good deal easier to elevate silage by machinery than it is to raise it out of the pit by hand. If, however, you desire to try a pit silo, the walls must be thoroughly cemented to prevent loss by earth contact and the ground-water should not rise above the bottom of the pit.

### Feed Value of Horse Chestnuts.

*Are buckeyes or horse chestnuts good for horse feed? They are abundant this year and might be cheaper than grain.*

Horse chestnuts are used to a limited extent in Europe as a feed for different classes of farm animals, and mostly roasted and ground. They are high in starch and similar components of considerable feed value, but contain certain bitter principles that make them unpalatable to live stock. It is often difficult, therefore, to get stock to eat them, but when once accustomed to the chestnuts, they will take them without difficulty. Beef cattle and milch cows will eat as much as ten to fifteen pounds of fresh chestnuts per head daily; horses five to six pounds; hogs two to four pounds, etc. The simplest method of preparation is to roast them, which destroys largely the bitter principles; or the shelled and ground chestnuts are soaked in water for two or three days, or boiled, and then fed mixed with grain feeds, either wet or after having been dried.— F. W. W.

# PART VII. DISEASES OF ANIMALS*

### What Is a "Very Light Diet"?

*In the case of sick animals, a "very light diet" is sometimes prescribed. What is a "very light diet"?*

A "very light diet" consists of just enough nutritive elements to barely support the actual needs of an animal. As there is such a wide range of rations and amounts, it may be said that a "very light diet" in any specific case would be just about one-half what that animal has been used to having. This slim ration would do no harm for a period of two weeks.

### Old Wire Cut Swells.

*We have a colt cut on wire just below the fetlock on one of her front feet, about a year ago. It is all healed up now but the foot just above the hoof tends to swell up and cause the animal to limp. We have relieved this twice by the application of liniment, but it is appearing again. Could this be due to some other reason, perhaps such as rheumatism?*

Evidently a foreign substance remained in the wound and is still inside. The animal should be examined by a competent veterinarian and this substance removed, as it will never be right till this is done.

### Colt Has Sore Jaw.

*I have a colt that has a sore under its jaw, where the halter strap goes, the size of a quarter. There is a scab which is partly mattered. When I feel the sore there seems to be a lump 2 inches in diameter on the bone. It does not seem to hurt the colt and is not noticeable. The colt's blood does not seem to be in good condition.*

Give this colt half an ounce Fowler's Solution once a day. Heal up the sore with carbolated vaseline and do not allow anything to rub it till healed.

### A Staggering Colt.

*A mule colt a week old began to stagger and fall, later it could not get up, hind parts and legs very swollen. Seems better at times. Other times has weak spells. Appetite good.*

This is due to congenital troubles of the circulatory system of the posterior extremity. Stimulate circulation by friction and arrange so it cannot injure itself by falling. The colt will probably recover, unless the parts become gangrenous through circulatory insufficiency.

*The answers in Part VII are furnished in part by Dr. E. J. Creely of the San Francisco Veterinary College, and in larger part by Dr. H. B. Wintringham of Petaluma.

### Pull Colt's Teeth.

*We have a four-year-old colt that has not shed her first set of front teeth, and the second set are coming out above them. Should we have them taken out, or will they drop out?*

Pull out the milk teeth.

### Ringbone on Colt.

*My colt has a hard growth just above the hoof on the hind leg. Sometimes it goes lame for a week or so but most of the time it is all right. It has been that way ever since it was a little colt.*

Your colt has a ringbone, due to an injury and should be fired and blistered by a graduate veterinarian. He should use a needle point iron so no blemish will remain after the operation.

### For a Congenital Crooked Leg.

*I have a colt five days old which was born with a crooked foreleg. It cannot place it on the ground, but holds it leaning backwards. I have been rubbing the cords four or five times a day and it places its foot on the ground a little now. Would it be a good plan to put splints on it or would the rubbing be enough?*

There is an operation for this trouble which can be done by a qualified veterinarian. It should be done right away to bring the best results. If this fails or can't be done, splints often bring relief. Stretch the limb to its normal position, wrap limb with cotton and bandage with muslin; between each layer of the bandage apply plaster of paris. Put on at least five layers. This bandage should be reinforced with strips of tin bent to fit the leg. Leave bandage on not longer than seven days and reapply if necessary.

### Tonic for an Old Horse.

*I have an old mare that has been in poor condition four or five months. I feed her barley and stock food twice a day along with good oat hay. She also runs on pasture. She eats everything readily enough, except the hay. I have had her mouth examined by two different veterinarians who say it is all right.*

You have very probably stated the trouble when you say she is old. The following tonic may help her and is worth trying: Powdered nux vomica 2 ounces, potassium nitrate 2 ounces, powdered ginger 2 ounces, powdered iron sulphate 2 ounces, powdered fenugreek 8 ounces. Give two ounces of this in the feed twice a day.

### Cracks in Frog.

*On the surface the frog in our mare's foot looks sound, but in places just under the surface it is sort of honeycombed and little cracks and*

*crevices extend from ¼ to ¾ of an inch in the foot. She isn't lame and it does not seem to be sore. I am now keeping her feet as dry as possible.*

Clean out the cracks and crevices in the frog, and pack them with powdered calomel once a day. Also keep feet as dry as possible. This treatment should be kept up till cracks show tendency to grow out sound and all odor leaves.

### Kill Horses With Farcy.

*What can be done for farcy in horses?*

Farcy or glanders in horses should be treated only by destruction of the animal and either burning or burying the carcass deeply.

### Persistent Neck Scab.

*My horse has a black scab on the back of her neck. It seems to have a root.*

This is sitfast. Cut it out with a sharp knife and paint it with tincture of iodine daily until healed.

### Bony Growth Under Lip.

*I have a fine horse colt that has a growth inside his underlip, between lip and the gum. It is a soft, bony substance. Has been cut out twice but grows back again.*

This is a benign cancerous growth which should stay removed if all its substance is taken out when operated on. After removal, it should be painted with tincture of iodine two or three times a day until healed.

### Antidote for Formaldehyde Burning.

*I used formaldehyde which was prescribed for thrush, which worked well and I thought the horse was cured. I find he has ham-like growths growing out of the frog behind on each foot, and when I work him, he becomes quite tender-footed.*

You used your formaldehyde too strong. Get some butter of antimony and paint on growths every two or three days until they disappear.

### Probably Lockjaw.

*My neighbor has two horses afflicted in the hind legs, which seem stiff and sore; next they seem weak in the couplin and stiff in the neck. Two days later both were down perfectly helpless; lay and lashed with their forefeet. They neither eat nor drink. Please give us treatment, and is it contagious?*

The trouble is more than likely lock jaw, and the animals are very probably dead before treatment can be applied. This is not a contagious disease.

### Catarrhal Enteritis.

*I have a mare that is 12 to 15 years old that has been scouring for several months. She looks healthy in every way and her eyes are good. She has a ravenous appetite and wants to drink about twice as much as when she is not scouring. Her hide is not very tight and she is shedding fairly well. There is almost a constant rumbling inside and she passes gas and water every few minutes.*

The horse has catarrhal enteritis. Give her six tablets Abbotts' sulpho-carbolates compound three times a day crushed up in feed or dissolved in water. Also one ounce salol twice daily with one ounce powdered ginger.

### Horse Urination.

*My horse will get into the position of urinating from one to five or six times previous to urinating. I have given an ounce of saltpetre in the feed twice a day for two weeks. Shall I continue the saltpetre treatment, and for how long?*

Discontinue the saltpetre and give the following: Urotrepin 4 ounces, Sodium salicylate 4 ounces, Sodium Benzoinate 4 ounces, Fluid extract Uva Usi 8 ounces; water enough to make one pint. Give one ounce three times a day.

### Treatment for a Cough.

*A horse has a bad cough which does not seem to be epizootic, for she does not run at the nose, although she coughs up a thick matter.*

Take Glyco-heroin, 8 ounces; cod liver oil, 6 ounces; spirits camphor, 2 ounces. Mix, give tablespoonful three times daily. Wet hay, feed from the ground.

### Horse Caught Cold.

*Can a young horse catch cold while steady at work if not very warm, by drinking cold water? I have been hauling fruit a distance of nine miles and as I left home very early in the morning my horses would not drink much, so I water them when about half way. I did not suppose, as he was not allowed to stand after drinking, that he would take cold. Also, what is the cure?*

It is highly improbable that an animal would get a cold under the conditions you mention. Give 5 grains potassium bichromate in one ounce of water three times a day.

### Horse's Throat Sore.

*I have a horse that runs from the bowels. He will also stand and drink for fifteen or twenty minutes without taking his mouth from the water; he eats every thing put before him.*

If you watch this horse closely while he is drinking you will notice that the water is returning through his nose. He has pharyn-

gitis or sore throat. Syringe his mouth and throat out four or five times daily with a saturated solution of potassium chlorate. Also have his teeth examined by a competent man.

### Treatment for "Roaring."

*Whenever our young horse runs or works she has a thick, heavy breathing. A swelling first broke out under her throat and then one formed on her breast, which we had lanced. Otherwise, she seems to be in perfect health. What can be done for her?*

Apply a good blister to the throat such as the following: Powdered cantharides, 2 drachms; red iodide of mercury, 2 drachms; lard, 3 ounces. Rub this in well and wash off at the end of forty-eight hours, and apply vaseline. If this does not relieve trouble in one month the only remedy left will be an operation for roaring, which should not be performed until animal is six years old.

### "Strangles" or Distemper.

*We have two horses which first had sore throat and a slight discharge which did not last long, and a cough. After a week the legs began to swell from the feet to the body, then came a slight swelling about the head. One of them broke out under the jaw before swelling began. They have bright eyes and eat well.*

The trouble is strangles, or colt distemper. A veterinarian should be called early in the disease as many cases result fatally from complications such as pneumonia, dropsy, or multiple abscesses. Feed only invalid food (hot bran mashes, grass, etc.). Give a heaping tablespoonful of granular sal nitre three times daily in bran mash and inject leucocytic extract once daily.

### Foreign Body in Eye.

*I have a horse with a discharge of yellow mucus from the eye. I found some small hairs in the corner of the affected eye and these were surrounded by grainy and hardened mucus. Washing the eye does not help the trouble.*

Careful examination after benumbing the eye with a four per cent solution of cocaine, will reveal a foreign body in the eye, or the lachrymal conduit (a tube which carries the tears from the eye to the nose). If you raise the nostril and look inside the nose you will find the lower opening of this conduit. Bathe the eye several times daily with cold boracic acid water, a teaspoonful of boracic to one quart of water.

### Perhaps Not "Moon-Blindness."

*The eyelids of my horse become puffed and discharge a watery substance as soon as warm weather comes on every summer. The local veterinarian calls it "Moon blindness" and says there is no cure. During cool weather the trouble disappears. Bathing with cold water twice a*

*day seems to keep the trouble in check to a certain extent. During winter and spring the animal is up on the bit at all times, but while still keeping in good order, becomes lazy as soon as the eyes begin to run.*

Moon blindness is incurable, but as you have not given sufficient symptoms to make a positive diagnosis of this trouble, try the following treatment: 1 ounce of 1 per cent atropin solution, 1 ounce 1 per cent eserine solution. Place a few drops of one of these in the eye once a day and the following day use the other, alternating the solutions daily. Also place a piece the size of a pea of the following ointment in the eye twice a day and rub in: 1 ounce 2 per cent yellow oxide of mercury ointment.

### Moon-Blindness of Horse.

*I have a horse that goes blind every year in the spring. This spring he has gone blind twice. For a few wecks he goes entirely blind—the pupil turns white. Can anything be done to keep him from going entirely blind?*

Your horse has moon blindness or periodic ophthalmia, which is incurable and in most cases produces blindness. A remedy which is of some benefit consists of a fifty per cent solution of argyrol. Place a few drops of this in the eye several times a day during the attacks.

### Inflammation of Joint.

*After traveling seven or eight miles, my horse goes lame in the right hind leg. When she stops she holds the foot up as though tired or it aches. I can find no pebbles, bruises or other causes. I can't find just where the trouble lies.*

Your horse has gonitis or inflammation of a joint. Without an examination it is impossible to state what joint; you will have to determine this for yourself or employ a veterinarian to do it. To the affected joint apply tincture of iodine once daily for several weeks and give animal a rest while doing this.

### Founder.

*My mare has become very stiff in the shoulders. She is thin and looks twice her age. When standing she seems to be in pain and is continually shifting her weight from one forefoot to the other. She stands with her forelegs slanting from her body and her breast deeply sunken.*

The mare has been foundered. She should be kept standing in a mud hole or running stream five or six hours daily and given a heaping tablespoon of saltpeter three times daily, in a bran mash. The disease is caused from indigestion. Her teeth should be filed and a good stomachic administered twice daily. A qualified veterinarian should be consulted, as founder of several days' standing without treatment may result in incurable chronic founder.

### Treatment for Sweeney.

*I have a horse that has a sweeneyed shoulder. Can you suggest treatment?*

The best treatment in the case of sweeney is repeated mild blisters. Try the following blisters: Powdered cantharides 4 drachms, lard 2 ounces. Rub well into shoulder for twenty minutes to half an hour. After forty-eight hours grease well with lard and wash off with soap and warm water. Reapply in four weeks' time. If you care to do so daily very good results can be gotten from rubbing with a good stimulating liniment into affected parts for about half an hour to three-quarters of an hour. This, however, takes time and a considerable amount of labor to get results.

### Sore Navel.

*I have a six-year-old horse which has a sore navel for four or five months; does not seem to hurt him, but will not heal; does not bleed nor discharge pus.*

Apply the following mixture once daily: Tincture iodine, 4 ounces; lysol, 2 ounces; tincture benzoin, 2 drachms; oil cinnamon, 1 drachm.

### Caused by Bad Teeth.

*A mare six years old, was all right till recently, when she fell off in flesh, lost her spirits and seemed like an old hack. She has a craving appetite but her food does her no good. She is weak and thin, hair shaggy and rough.*

This is due to projecting or loose molars. Have the best veterinary expert dress and treat the mouth after which use the following: Nux vomica, pulverized, 2 ounces; iron sulphate, 1 ounce; pul. gentian root, 2 ounces. Mix and make sixteen powders. give two daily.

### Severing of Tendon.

*One of my horses has recently been cut a few inches above fetlock joint on inside of right hind leg. The attending veterinarian said one of the tendons is cut and the other partially. When stepping on foot fetlock nearly touches the ground. Am treating her as directed by veterinarian. Will the horse ever recover?*

The tendon is severed. Recovery will depend on the treatment. It will be advisable to apply a soft bandage to the leg and cover this with electrician's tape to support the leg while the tendons are uniting. This bandage should be changed every few days and the wound dressed.

### Salivary Fistula.

*My horse developed a swelling in his throat and left jaw, which on blistering and poulticing discharged pus and barley beards. It has healed over with the exception of a small place where saliva is discharged*

*freely when the horse eats. The liquid spurts out in a stream the size of a straw, especially when the horse is eating grain.*

The abscess was caused from barley beards working up into the gland and has resulted in what is known as salivary fistula. The saliva will escape in great quantities while the animal is masticating the food. This requires an operation to close the fistula and direct the saliva in its proper channel, into the mouth; when this is done by a qualified veterinarian the horse will be easily cured. In the meantime wash out the opening twice daily with lysol water, teaspoonful to one quart of warm water.

### Canker of the Feet.

*I have a mare that has canker in both front feet. Two veterinarians pronounced it "Canker," and treated her for it, but she is no better. Is there a cure for it, and if so, what is it?*

Canker of the feet is a bacterial origin and the infection will spread to all four feet, if not watched carefully. This disease is successfully treated by carefully cleansing the stall floor and keeping it clean and dry and using a strong disinfectant, such as Chloride of Lime, sprinkled about the floor. Use a four per cent solution of formaldehyde, to wash out the foot twice daily, getting the solution well into the cracks. Even under this treatment it takes some time to cure this disease.

### Worms in Horses.

*Will you kindly advise me of a remedy for worms in horses?*

You do not state kind of worms. Try the following, however: Tartar emetic 1½ ozs., powdered gentian root 2 ozs., powdered anise 2 ozs. Mix and divide into twelve powders and give one powder twice daily on back of tongue. When all have been given, give the horse the following drench on an empty stomach (after 12 hours' fasting at least): Raw linseed oil one pint, oil of turpentine and sweet spirits of nitre, 2 ozs. of each. The above is a mild physic and the horse must not be exposed to chill or worked or given much cold water.

### Scours of Mare.

*What will stop my mare from scouring? She is quite all right for the first two miles. Then she starts to scour. She has been doing this a month or more.*

This is due to indigestion. First give a mild physic of raw linseed oil, one pint, and one ounce oil of turpentine, on an empty stomach. Care must be taken in administration of a drench to horses. Do not try to hurry the operation. When bowels have returned to normal, which should be 12 to 16 hours after drench commences to act, give one of the following powders twice daily in feed for about two weeks: Sodium bicarbonate, 3 oz.; powdered nux vomica, 2 drams; powdered gentian root, 1½ oz.; powdered anise, 2 oz. Mix and divide into six powders.

### For Ring Bone.

*A horse nine years old has a ringbone on its forefoot of about one year's standing. Can it be cured or lameness reduced?*

Have this fired and blistered. If this does not entirely relieve the lameness, have animal shod with a roller shoe which will make it serviceable.

### Horse With Mange.

*I recently bought a mare which the seller told me had chicken lice. I am convinced the trouble is worse than that. Scratching, she threatens to tear the stable down. Tail is rubbed almost bare at base, and mane is somewhat rubbed by violent scratching.*

The horse has scabies. Treat in the following manner: Get some liquor cresolis compositus and make solution in water, 2½ ounces to the gallon of water. Wash your animal off thoroughly with this, being sure to remove all scabs and crusts. Have your druggist put up the following: Oil of tar, 1 ounce; flowers of sulphur, 1 ounce; oil Cajaput, 1 ounce; neutral oil, enough to make one quart. After animal has dried from the washing, rub this in well all over animal and repeat the above about every ten days. Two such treatments should cure your animal.

### Acne, a Skin Disorder.

*I am sending scabs from my horse. Please tell me what the disease is and what to do for it.*

This is Acne. Give Fowler's solution of arsenic in ½-oz. doses three times a day and give plenty of cooling substances in the diet, such as bran, greens, etc.

### Fast Growing Warts on Horse.

*What will cure warts on my horse? They are growing rapidly and becoming a great disfigurement.*

Apply a five per cent solution of chromium trioxide daily with a brush.

### Fowler's Solution Safe Under Directions.

*To a horse with itching skin I have given one ounce of Fowler's solution daily until the horse has had twenty ounces. He is somewhat better, but not cured, as he still itches and those little postules are still coming through. Skin and hair come off, and a little fluid runs out of same, but is getting better all the time. I would like to know if it is dangerous to give too much or too long of this Fowler solution of arsenic.*

There is no danger in giving the arsenic if given according to directions. Use the following externally in conjunction: Olive oil, 16 oz.; spirits camphor, 2 oz.; Pearson's Creoline, 1 oz.; kerosene, 3 oz.; oil cedar, 3 oz. Mix and apply to itchy spots once daily, after washing with sheep dip. Whitewash stall very often and scrub harness.

### Swelled Ankle.

*An eight-year-old horse about a year ago got lame in his hind leg by a swelling, just above and back of the ankle joint. It looks very much like wind galls and feels soft. It gets quite large at times if I work him hard.*

This is bursitis and tendonitis, one of the meanest kinds of lameness to treat. Put on a high heel shoe, no toe; shorten the toe of hoof and apply a cantharides blister; simple cerate, 3 oz.; cantharides, ½ oz. Cut the hair and apply thoroughly. After four days, wash off the blister and grease once daily. It would be better to have a veterinarian cauterize with a hot iron. The horse should be put on pasture two or three months.

### An Unclean Wound.

*When I took my horse in from the field where there were fir limbs covering the ground, I noticed a hole on his leg about the size of a 25-cent piece. I soaked a wrapper in cold water and put it on every night for about a week. The leg swelled from knee to the hoof about three times its size. Proud flesh started right away, so I blistered it good four times about every 10 days and then I kept it greased and it healed up. But it would discharge pus and a watery substance about every month for one or two days, then would stop and heal over again.*

Your horse has a foreign body in the wound, either a piece of the fir limb that caused the trouble or a broken spicule of bone. Thoroughly sponge out the wound with a two per cent solution of cresol and wash your hand in some. Insert your finger into the wound, and see if you can feel this foreign substance and remove it. The wound will not heal up as long as it remains, but as soon as removed will heal, if you wash it out daily with the above antiseptic solution.

### Cracks Below Joint.

*My mare has cracks open under the joint on both front feet, then it will scab over.*

Mix the following: Zinc oxide, 4 ounces, iodoform ½ ounce, glycerine 2 ounces, carbolic acid 2 drachms, and apply twice daily after thoroughly washing with cresoleum water and castile soap. Remove every vestige of scab and hair from about the sores.

### Hock Joint Cut.

*A brood mare got cut with a barb wire on the hock joint and kept lame, and soon did not put her foot down to the ground. Her hip is losing its flesh and the joint is large.*

The animal has a wound in one of the worst places on the body to heal properly. Keep her tied up and as quiet as possible to prevent movement of the joint. Clean up wound with hydrogen peroxide, then paint it twice daily with following mixture: Turpentine 4 ounces, raw linseed oil 4 ounces, tincture aloes 2 ounces, nitric acid 1 ounce,

sulphuric acid 1 ounce. It will require several months to heal this wound. The shrinking of the hip is due to the fact that she is not using that leg.

### For an Old Wire Cut.

*We had a young mare cut about eight months ago by a wire, from the shoulder to a little above the knee, and laid it open to the bone, not cutting an artery. Had a veterinary fix it up; it commenced to heal, when she tore it open with her teeth. After that we kept her tied up in the barn, but just as soon as it would get partly healed she would hurt it again. For the first three months she wasn't stiff in the knee, but I think standing on a board floor so long has caused it to be stiff, for the knee was not hurt.*

Paint the leg with tincture of iodine once daily. Paint from just below the knee to the elbow, but do not paint just back of knee in the joint. Give animal moderate exercise and continue the treatment from two to three weeks. If skin becomes badly blistered, discontinue treatment for a few days and apply vaseline to the surface.

### Fistula on Horse's Shoulder.

*Over a year ago my horse turned the buggy over and was rammed with one of the broken shafts between his hind legs. After he recovered from the wound, a swelling grew from the wound up half way on his belly and then went back again. Soon his shoulder began to swell and he was quite stiff in the injured leg. Then a place formed on the swelling which seemed full of pus. I took him to the veterinary hospital and they opened it. The swelling still runs a bluish pus, but he walks almost as though there was nothing the matter and eats well and is fat.*

This is the result of a so-called cold abscess being given improper drainage, which has resulted in a fistula. There is a pus pocket lower than the external opening. To effect a cure, this pocket must be opened at its lowest point so that no pus can accumulate and drainage be complete. A qualified veterinarian should be called to do this.

### Swelling on Horse's Thigh.

*A swelling came on my filly's thigh about the size of a fist. After about three days, it broke and has been running since. The pus exuded is of creamy color and consistency and occasionally carries a little blood. Then another swelling, somewhat smaller, arose about four inches above the original and for a while drained through the old break. However, it does not drain now, and is swelled tight and about ready to break itself.*

These abscesses may have so many causes that it is impossible without an examination to give the precise cause. Get a syringe and wash out abscess twice daily with a 2 per cent solution of liquor cresolis compositus. Explore the abscess with your finger to be sure there is no pocket formed from which there is not good drainage, and also for

foreign bodies. Have a veterinarian test this mare for glanders and destroy her if she reacts.

### Mule in Poor Condition.

*I have a mule which did not shed off this spring and is in poor condition. His water seems bad.*

Fix the teeth and give the following in a bran mash once a day: Nux vomica pulo 3 ounces, iron sulphate 2 ounces, soda bicarbonate 6 ounces, sulphate magnesia 4 ounces and pulo aniseed 2 ounces. Mix thoroughly and give a heaping teaspoonful twice daily in mash.

### Mule With Rheumatism.

*My eight-months-old mule seems to be sore all over and stiff. He eats and drinks well, but sometimes cannot get up without help. He was weaned about a month ago.*

This mule is rheumatic. Give 2 drachms sodium salicylate and 2 drachms hexamethylamine twice a day.

### Mule Lame at Stifle.

*I have a mule lame in the left hind leg. She seems to be out of joint in the stifle. She only bears her weight on that leg a little when she walks.*

If you are sure your mule is lame in the stifle, clip hair off for about six inches around the joint and apply the following blister: Pulverized cantharides, 2 drachms; red iodide of mercury 2 drachms, benzoinated lard 3 ounces. Rub this in well over the clipped area for ten to fifteen minutes. Tie the mule up so he cannot bite the blister and wash blister off in 48 hours with warm soap and water, then apply vaseline to blistered area. Rest mule one month after blistering.

### Ruptured Mule.

*How shall I treat an 18-month-old mule colt with a rupture on the median line, midway from the navel back? Rupture has been apparent for a year, gets no larger and can be entirely reduced by pressure from the hand.*

The animal will outgrow this. If he should not it can be easily removed by an operation.

### Mule With Rectal Tumor.

*I have a large gray mule about ten years old, that developed a growth on her rectum about six months ago that grew till it was the size of an egg, and then broke and discharged a black pus. The growth is now as large as one's fist, with a cavity in it. The mule is in good condition.*

Gray mules and horses are subject to this trouble, called melano sarcoma. There is no cure. The tumors gradually become larger, but do not affect the health of the animal unless their growth interferes with some of the vital functions. Interference with the growth only aggravates the trouble.

### White Diarrhoea in Calves.

*Our calves die within 24 to 48 hours from the time they are born. The cows are healthy. It seems to be a sort of a white or yellow diarrhoea, thin watery passages of a light yellow and white color.*

The calves have white diarrhoea. The disease enters the body by two channels, the navel and the mouth, but principally the latter. Paint navels immediately after birth with tincture of iodine. If calves are allowed to suck, take first milk from udder by hand, wash and dry udder and teats with a two per cent solution of cresol before calves are allowed to suck. Clean up stables and feed-troughs and disinfect them with same solution. Let as much sunlight get to your floors as possible. The above will have a strong tendency to prevent disease. Also, do not allow calves a full ration; cut down their amount of feed one-half. To infected calves, give the following: Fluid extract of ginger 2 ounces, tincture opium 2 ounces, formaldehyde, 64 minimums, and water enough to make a quart. Give 2 ounces of this mixture in one pint of water twice the first day, withholding all feed. If necessary, give two ounces medicine in one pint milk, twice the second day.

Another medicine for infected calves is three tablets sulpho carbonates three times a day.

### For an Over-Fed Calf.

*I have a Jersey calf sixteen days old that seems to have lost her appetite. She mopes around and will have to be forced to eat. She has been having from one and one-half to two quarts of skim milk three times a day for a week. Today I cut down her milk to one quart and put in a raw egg. She seemed to be weak and thin from the start, but seemed lively enough.*

You have been overfeeding this calf. Give 4 ounces castor oil, and follow with this: Fluid extract ginger 2 ounces, fluid extract nux vomica ½ ounce, fluid extract gentian 2 ounces, alcohol, 2 ounces, and simple syrup to make 8 ounces. Give one ounce of this twice a day in one pint whole milk.

### Calves Lose Eyesight.

*The eyes of my yearling calves become mattered, sore and inflamed, and the animals almost lose their sight. Oftentimes one eye becomes entirely out. The disease has now spread among the younger calves.*

Your calves have an infectious conjunctivitis. In either case, instill a few drops of a 50 per cent solution of argyrol twice a day.

### Calves With a Cold.

*I have lost two calves. They caught cold which settled in their throat and made it very painful for them to swallow or breathe; also had fever.*

For calves affected as you describe, apply mustard liniment to the throat daily, rubbing in well. Give internally the following: Fluid extract nux vomica, 1 ounce; fluid extract belladonna, one-half ounce; fluid extract ginger, 2 ounces; aromatic spirits of ammonia, 8 ounces, and water enough to make a pint. Dose: one ounce twice a day in one ounce of water.

### Pneumonia in Calves.

*I have lost several calves. The animals scour a little at first, but this subsides with dieting. Some have a thick discharge from nostrils, but this stops before they die; others do not have this symptom. They eat until they die and look well except that they are droopy. Post-mortem shows the lungs with dark spots, some quite large. They do not penetrate the lung, but just show on the outside. A few have shown small sore places under the tongue near the front teeth; no other sores in the mouth. Stomach is generally full but soft; no inflammation here or in the intestines.*

These calves have contagious pleuro-pneumonia, or lung plague. There is no treatment which will cure this trouble. Separate all sick from healthy animals. Thoroughly disinfect daily barns and buildings, using two per cent solution of cresol. Be sure also to wash out and disinfect all feed-troughs or racks from which they feed before and after feeding. Give all the calves one dose of the following, once a day: Guiacol, 2 ounces; aromatic spirits of ammonia, 1 pint; spirits of camphor, 8 ounces, and fluid extract of ginger, 6 ounces; dose, 2 ounces.

### Navel Rupture Requires Operation.

*I have four calves, age two and three months, which are ruptured in the navel; have been that way about a month.*

Have a competent veterinarian operate on the calves for the ruptures. This offers the only remedy.

### Lung Worms in Calves.

*Give me a remedy for lung-worms in calves. Last year I lost a number, and I have some now that have commenced to cough.*

There is no absolutely certain remedy for this trouble. Two of the best treatments are as follows: Get a hypodermic syringe which will hold two drachms. Force the needle into the interior of the trachea or wind pipe, and inject two drachms of the following: ether, 2 ounces; oil of turpentine, 1 drachm; or use benzine in 2 drachm doses. Continue this treatment daily until symptoms are relieved.

### Convulsions in Healthy Calf.

*I have just lost the finest month-old calf I had. I fed milk until it was two weeks old, then fed two handfuls oilcake meal with about a quart of milk, thinning the gruel with boiling water. This I have given the past two weeks, the calf apparently doing fine and eating with great relish. Today I discovered it lying down in violent convulsions, which lasted until death three hours later. Until then it had been perfectly healthy, and in fine condition.*

If you had opened the calf you would probably have found a nail, wire, or other such substance penetrating one of his vital organs. Calves are prone to lick up such things, with the results you have experienced.

### Faces and Necks Swelled.

*One of our calves breathed hard and had a swelling under the chin. Now the swelling has gone clear down between the front legs and is a great hard bunch. It is also going up the sides of its face. It grits its teeth and its nose is dry.*

Your calves are probably affected with liver fluke worms. An autopsy will be necessary for a positive diagnosis. There is no cure. Prevention may be had by a change of water supply as it is through the water they become infected.

### Bloody Urine.

*A heifer calf for the last day or two has been passing a mixture which appears to be about one-third blood mixed with the urine.*

This may come from the kidneys or bladder and is probably due to an ulcerative condition of the mucous membrane. Adrenaline chloride 1 in 1,000 solution. Dose: 1 teaspoon to ½ cup salt water once every third day. Cease giving if the blood stops.

### Mucous Discharge and Cough.

*Three-months-old calves discharge whitish or clear mucous from nose; have slight cough; lose strength rapidly.*

Put calves in closed room and heat vapo-cresoline so they will have to breathe the fumes. Bathe with hydrogen dioxide. Separate the sick from the healthy ones. Give daily injections of Archibald's Leucocytic Extract.

### Treatment for Blackleg.

*What is the cause and cure for blackleg?*

Blackleg is caused by the invasion of the animal's system by a form of bacillus anthracis. There is no cure for the disease, the only thing to be done being to prevent the disease as much as possible by vaccinating all young cattle. This should be done by a qualified veterinarian if one is at all procurable.

### Creolin for Calf Lice.

*What is the most satisfactory method to rid calves and young heifers of lice?*

Wash animals all over with a 2 per cent creolin solution three times at intervals of four days; 2½ teaspoonfuls liquor cresolis compositus to the pint of water will give a 2 per cent creolin solution.

### Pica or Depraved Appetite.

*Whenever my cow manages to get loose in the stable she licks the stable floor with her tongue. She gets plenty of salt and has a salt stone.*

This is pica or depraved appetite. Place in separate containers the following substances and allow the cows free access to them: iron sulphate, powdered sulphate, black antimony, salt, and saltpeter.

### Tonic for a Cow.

*I have a cow in poor health as her hair looks bad and she is thin. She is a heavy milker on green feed, but does not milk long on dry feed. She has a running at the nose but does not cough.*

Have this cow tested for tuberculosis by a graduate veterinarian. If she reacts, dispose of her, as there is no cure for tuberculosis. If she does not react, give her the following tonic: Powdered nux vomica, 1 ounce; powdered gentian, 2 ounces; powdered iron sulphate, 1 ounce; powdered potassium nitrate, 1 ounce; powdered ginger, 1 ounce; powdered fenugreek, 2 ounces. Give 1 ounce of this mixture in feed twice daily.

### Indigestion.

*My cow eats well but while eating and afterwards while chewing her cud, she belches, making a noise like a forcing cough and throws up a bunch of food chewed very fine. She seems in good health otherwise.*

This is fermentation due to indigestion. Give a heaping tablespoonful of soda bicarbonate twice daily and feed dry food in preference to slop.

### Cow With Chronic Indigestion.

*I have a young cow which I dare not feed any hay at all, neither green nor dry, because she bloats every time I feed her. I just feed her linseed meal, and I had tried to get her to eat alfalfa meal, but she will not eat it, nor bran. I have to drench her with bran, or at least I make her eat it by putting it down her, and I do the same with the linseed meal. I make a solution with it and pour it down her. The only thing she wants to eat is the hay. I sometimes get her to eat a little grain.*

The cow has chronic indigestion. Give her two pounds of epsom salts in enough water to put it into solution. Have the following put up: Fluid extract ginger, 8 ounces; fluid extract nux vomica, 2 ounces;

salicylate of sodium, 8 ounces; water, 8 ounces; and aromatic spirits of ammonia, enough to make one quart. Give two ounces of this twice a day before feeding.

### Cows Not Breeding.

*I have cows which do not conceive with same bull which gets calves with others. I am told that douching with slippery elm solution would correct acidity that might be in the mucous membrane.*

Slippery elm will not overcome acidity nor help in your condition. Douche with a solution of potassium permanganate, 1 drachm, to water one gallon, daily for one week, then use 2 ounces sodium bicarbonate to one gallon of water daily up to the day preceding service and you will get results.

### Sterility From Wound Injury.

*I have a cow that calved a year ago. Occasionally for two weeks after calving she would discharge blood. Am unable to get her with calf again.*

The animal was in all probability injured in the os uteri at the time of calving which would account for the discharge of blood. In all probability there has been a formation of "scar tissues" in the os which is not uncommon, and that this either closes the opening or contorts the neck in such a manner as to render fecundation impossible.

### Comes in Heat Weekly.

*A cow came in heat when her calf was a few weeks old and was served. She came in heat and was served twice since. Now she comes around about every seven days.*

This cow very probably has cystic ovaries. Have a qualified veterinarian examine her. If this condition exists he can break them down and your animal will breed again.

### Cow Doesn't Breed.

*I have a six-year-old cow, fresh about three months ago. She has only been in heat once since coming fresh, and at that time I could not take her to the bull. Is there any way to bring her around?*

The period of oestrum in the cow is every eighteen or twenty-one days. Ascertain whether or not a bull has visited your place unknown to you. If sure that the cow has not been with a bull, irrigate her vagina once daily for one week with a 1 per cent creolin solution and put her on a course of pulverized iron sulphate in two-drachm doses twice daily for two weeks.

### Soda for Non-Conception.

*My neighbor told me, in the case of my cow who could not conceive, to take one tablespoonful of baking soda when she came around again, dissolve it in a ten-pound pail of water as warm as you think*

*a cow can stand it, and run your hand inside of her. Grease your hand so you won't make her sore. Clean out clean; then take your syringe, use entire 10-pound pail of water slowly so she can pass it out after each syringeful. Let her stand for one hour after washing. Then let the male serve her and you will not have any more trouble.*

There is no doubt that bicarbonate of soda is of aid in certain instances of non-conception where the secretions of the vagina have an acid reaction. Semen is neutral or alkaline in reaction; and its contained spermatazoa are easily destroyed by acid substances. If from various causes the secretions of the female are of an acid nature, conception will not take place, but if these discharges are neutralized by the use of soda bicarbonate, conception will take place—provided the acid condition is the primary cause to be overcome.

### Doesn't Come in Heat.

*I have a cow that had a calf nine weeks ago, but never came in heat since. What could I do about it? The cow had milk fever and was not very well for some time after. She eats well and looks all right otherwise.*

Under the circumstances her condition is natural. Give her plenty of good nourishing food and she will come in heat when nature is ready.

### Soda Not Good for Bloat.

*One of my best cows bloats on green feed. I don't like to stick her. Would not soda be good to make her belch up wind? If so, how much?*

By all means do not give a bloated cow soda, as it will make her bloat worse than ever. The contents of a stomach filled with green feed is acid and the addition of soda will cause the generation of carbon dioxid gas. Try feeding this animal on half dry feed and the other half green and her trouble will stop.

### Bleeds After Breeding.

*I have a heifer which has never had a calf. She has been bred three times, and each time had a bloody discharge a day or two afterward.*

This heifer probably has a growth in the genital canal. Only an examination can positively determine this. Have a competent veterinarian do this.

### Loss of Milk Flow.

*For about six weeks after freshening, my cow gave about five gallons of milk daily. Then, about two weeks ago she dropped in her milk in a couple of days to about a pint to a milking and then gradually came up till now she is giving a quart and a half.*

Your cow undoubtedly has been, and may be still, suffering with some serious trouble, as a cow will not dry up in her milk in such a

manner unless it is due to sickness, change of feed, or some other disturbance. Give the cow one to two pounds of epsom salts and one ounce of powdered ginger in a quart of warm water. Keep feed entirely away from her until she commences to purge, which should be about twelve hours, and then feed her lightly at first. After the bowels return to normal give the following twice daily for three days: mustard (ground) 6 ounces, powdered ammonia carbonate 6 ounces, powdered nux vomica 1½ ounces, powdered gentian 6 ounces, and powdered ginger 6 ounces. Mix and divide into six powders, giving one powder in ½ pound of molasses and 2 pints of ale or beer.

### Discharge From Cow After Calving.

*I have a cow that held her afterbirth for a week or so. Since then she has a white discharge.*

Douche out this cow twice a day with one gallon of water containing one drachm potassium permanganate until discharge ceases. Sometimes a cow may seem to clean and still retain a small piece of the after-birth when she calved. Continue douching until the flow stops and she comes in heat again.

### Locating Source of Bloody Milk.

*What shall I do for a cow which has blood in her milk?*

This is caused from an injury. Let some milk from the first and last flow from each teat stand in different glasses, so that the gland giving the bloody milk can be detected, then inject half water and half hydrogen dioxide, thoroughly kneading the gland, after which milk the gland of every vestige of fluid. Repeat once daily for several days, then test with the glasses again.

### Udder Trouble From Injuries.

*I have a cow that was hooked in the bag and that quarter has become hard. I used a milk tube and soon got infection, resulting in some slight inflammation, and some hard lumps. These teats recently dried up completely. One of the remaining teats then started to give bloody milk, and has since been inflamed and is now dry. Today the last teat which I have tried to dry off is full of garget and the quarter has become swollen.*

Apply the following to the affected parts once only: oleate of mercury, 2 ounces; adeps lanum, 2 ounces. Give internally the following: red iodide of mercury, 90 grains; potassium iodide, 4 ounces, water enough to make one pint. Dose: one tablespoonful twice daily.

### Lump on Udder.

*I have a cow that got a swollen udder one night about a week ago and it turned a bluish color. Now the bluish color has gone, but it has settled in a hard lump on one side of her udder. It does*

*not seem to interfere with the flow of her milk, and the cow seems to be in good health.*

Your cow just escaped losing her udder with gangrenous mammitis. Treatment same as preceding cases.

### Infectious Mammitis.

*A few boils started on the udder, then in the upper part of one teat there came a lump, and after three or four milkings it was impossible to get any milk from the teat. Then I used a milk tube in that teat for about one week. Now the soreness and swelling has disappeared and the teat and udder seem in good condition. The milk looks natural and cream rises well. But when the cream is pushed back the milk is dark or bluish and watery.*

The cow has an infectious mammitis and is evidently recovering. Milk at times contains blood in imperceptible quantities. Give your cow potassium iodide in two drachm doses twice a day for one week, dissolved in the drinking water.

### Udder Caked.

*I have a cow which started about a week ago to get a hard or caked udder. Her milk seems good, but I am afraid she will lose all of it.*

Apply camphor liniment to the udder once daily, rubbed in well. Wrap udder in a blanket wrung out in hot water and kept warm for two or three hours. Give internally three or four times daily fluid extract belladonna one drachm, fluid extract phytolacca, one ounce, until trouble subsides.

### May Be Tumor in Udder.

*I have a cow that freshened a week ago. There is a lump in her udder, close to a front teat, which does not seem to increase in size, nor hinder the milk flow in any way. The cow, however, kicks and shows signs of discomfort when the teat is milked. She will allow the lump to be massaged without any signs of pain.*

It is impossible to say definitely what this trouble is without examination. The lump may be a tumor and act mechanically to cause pain in milking, or the cow may have mastitis. A graduate veterinarian should be consulted.

### Cow With Garget.

*My cow had garget, or at least I doctored her for that and dried her up. She is fresh now and I want to know if her milk is good and if the trouble will return again. What is good for garget?*

Garget is mammitis. The milk is fit for use only after the animal has recovered. One attack renders an animal liable to another to a certain extent. It is impossible to give a general treatment, as cases vary considerably, but as a general rule a purge, such as from one to

two pounds of epsom salts with one ounce of powdered ginger and bathing the udder once or twice daily and rubbing in a mild liniment such as belladonna liniment, will effect a cure. Care must be taken to keep the animal in comfortable quarters and allow plenty of dry bedding.

### Doesn't Hold Her Milk.

*I have a Holstein cow, a very heavy milker, but she can't hold her milk from noon till night.*

Milk your cow oftener.

### Milk Squeezes Out.

*My cow loses much of her milk by lying in such a position that it squeezes the milk out. She is naturally an easy milker.*

Apply a saturated solution of tannic acid to the teats two or three times a day.

### Enlargement of Udder.

*What is the best treatment for cows' udders just before and after calving? Some of my heifers have the swelling extending along the milk veins nearly to the forelegs. The last one would not yield to hot water, so I put on some spavin cure, then greased it with lard; it reduced the swelling, but took off some of the skin.*

It is natural for the udder to become enlarged before and after calving, and the (milk) veins are enlarged to carry the blood in sufficient quantity. Leave it alone and it will resume its normal size by itself. Give plenty of exercise to prevent milk fever and see that bowels are regular.

### Dilator for Hard Milker.

*I have a nice heifer which is a hard milker, and I want to know if there is anything one can do for that condition.*

Spend ten minutes massaging the udder before milking. If the orifice of the milk duct in the teat is very small, send to the F. S. Betz Co., Hammond, Ind., for some teat plugs to gradually dilate the opening. Always boil plugs for fifteen minutes before inserting and keep them in a two per cent liq. cresolis comp. solution. Wash off teat with this before inserting. Insert after milking and allow to stay in between milkings. Specify catalog No. 1-15 Teat Plug No. 10L1006, get eight; they cost 25 cents apiece.

### Heifer Holds Milk.

*I have a heifer that has been fresh two months, and she holds her milk in the morning.*

Thorough massage of the udder is the best remedy for a cow which holds up her milk. Spend ten minutes at this night and morning over a period of several weeks.

### Leaky Teats.

*Is there any preparation that can be applied to a cow's teat to stop leaking? Every afternoon before milking, milk drops very rapidly from three teats and from the other teat it runs in a light stream. She has a fair size bag, and I only take enough milk for own use, calf getting balance.*

There is no preparation which, if applied to teats of cows, will prevent loss of milk. The best remedy is to milk often, say three times daily. Try removing the calf, and milking by hand entirely, feeding the calf from a pail.

### Cracked Teats.

*My heifer, fresh two days, has a cracked teat. It is between the opening at lower part of teat and the udder. Milk exudes from crack when milking.*

Heat a wire to red heat and cauterize crack, being sure to sear the tissues well into opening. Afterwards apply flexible collodion to prevent milk from leaking out and also to protect the wound.

### Warts on Cows' Teats.

*Give me some prescription that will remove warts from cows' teats.*

Get a stick of lunar caustic, moisten warts and rub caustic stick over them once daily until they disappear. If warts are large, tie a thread tightly around their base and they will fall off in a few days, or they may be clipped off with scissors and the wound touched up once with caustic stick. If teats become very sore, apply some zinc ointment before and after milking.

### Udder Treatment Before Calving.

*I have a cow due to calve soon. I have been trying to put her dry for two weeks and her udder is swollen. I milk once a day and the milk comes out in lumps and strings. Her udder is very hot and feverish. What can I do to prevent milk fever?*

Apply camphor liniment U. S. P. to the udder twice daily. Give your cow spirits of camphor internally in half ounce doses twice daily. A very light diet for a period of two weeks before calving has a tendency to prevent milk fever.

### Milk Fever and Milk Flow.

*Does milk fever lower a cow's production for the whole lactation period? My cow recovered and is in good flesh. How can I prevent milk fever?*

Milk fever does not affect the milk flow except for a short time following an attack. It would seem that you had got hold of an unprofitable animal. There are no certain procedures to use to prevent milk fever.

### Udder-Inflation Not a Preventive.

*My cow had milk fever. A veterinary surgeon inflated her udder and now in milking I get a full stream until finished. Would it be a good idea to inflate any cow when or after she comes fresh, to insure against milk fever?*

Do not give milk fever treatment to any animal except one affected with milk fever. There are too many dangers connected with the treatment to warrant its promiscuous use.

### Guarding Against Abortion Infection.

*A few days ago a neighbor told me that on the ranch I had rented the disease of abortion reigned here four to five years ago and the proprietor had to sell all his cows. Do you think it will infect my cattle in any way?*

There is some danger of your herd becoming infected, as it is not definitely known how long the bacillus will remain alive on premises once infected. You will be safe, however, if you give your barns, feed racks, water troughs, and corrals a thorough disinfection with a five per cent liquor cresolis compositus solution. A spray is the best means of applying this. Also give each animal in your herd one ounce methylene blue daily for six days, then wait six days and begin again, giving one ounce every other day for six more doses. You will then be safe if your disinfection has been thorough or your herd does not become infected from outside sources.

### Infectious Abortion.

*I bred one of my cows to what was considered the best bull in the community, being a young, healthy animal. I have since learned diseased cows (abortion) were bred to this bull some months before my cow was bred. Will this affect my cow? If so, what treatment should I use?*

This will very probably affect your cow. Give her one ounce methylene blue every day for six days, then discontinue for six days, and begin again, giving one ounce every other day until six more doses have been given. You need not worry about your other cows unless this one aborts, when it will be advisable to give each cow in the herd the above treatment. It would, however, be advisable to isolate this animal until she delivers her calf safely.

### Aborter Has Discharge.

*My cow which was due to calve Nov. 6 lost her calf about Oct. 11. The afterbirth did not come away until the sixth day. Since then she has a discharge of a yellowish substance. She has not increased in milk.*

Wash this animal out once daily with a solution of cresolis 1 per cent until the discharge ceases.

### Swelling Along Milk Vein.

*Just before calving my cow developed what at the time seemed to me to be a rupture of the navel, but a veterinarian said it was not a rupture. Since calving the swelling spread lengthwise of the body and now extends from her forelegs to her udder along the milk vein. at the navel it forms a sac which seems to be filled with a liquid, and the whole vein is much enlarged.*

The heifer has been infected through a wound, probably a scratch. Have a graduate veterinarian lance the sac immediately to provide drainage and then syringe the cut with an antiseptic. This treatment should stop all spread of the infection. While he is doing this it would be well to test for tuberculosis by the intradermal method.

### Swelling on Cow's Leg.

*My cow has a swelling on the inside hock joint. It looks and feels like a bog spavin on a horse's leg. The cow is not very lame, but she don't stand all her weight on that leg very long.*

Apply Lugol's solution of iodine to the swollen joint and rub in thoroughly with a tooth brush once a day. If skin becomes blistered wait till inflammation subsides before continuing to apply.

### Cow With Sores on Under Side.

*I have a cow that has small sores upon either side of tail and under her flank, behind her front shoulder, and upon her belly, which she licks and keeps raw. I can heal them up for a short time with axle grease but not permanently.*

Put a halter on the cow and surcingle. Attach halter-ring to surcingle by a stick passed between the front legs. This will prevent licking of sores which will not heal while being licked. Paint sores once or twice daily with equal parts tincture iodine and compound tincture benzoin.

### Pus Bag on Shoulder.

*A lump the size of a man's fist appeared six weeks ago on the point of my cow's shoulder. I blistered it three times. It became soft and I lanced it. A lot of matter ran out; but it has swollen hard to its former size.*

Lance again at its lowest point and make a large incision. Syringe out cavity once or twice daily with a solution of potassium permanganate one teaspoonful to the gallon of water.

### A Mouth Trouble.

*I have a Jersey cow that dribbles and froths at the mouth and grinds her teeth a good deal. Her coat is in good condition, but she does not attempt to eat any grass, though she is always ready for her hay and eats it well.*

Call in a graduate veterinarian and have him examine her mouth. There is probably a foreign body present or a bad tooth. Ulceration of the mouth will also cause this.

### Impaction of Paunch.

*Is there such a thing as a cow losing her cud, and if so, what can be done in such a case? I had a young heifer fall sick and she died, and after death we opened her and her paunch was full of hay not chewed. The lining of the stomach seemed to be eaten off. We never saw her chew her cud after she sickened.*

Cows do not "lose their cuds." Chewing the cud is an act of remastication before food is delivered to the fourth stomach for true digestion. Your cow had impaction of the paunch. In such cases give 2 pounds Epsom salts well diluted and 2 ounces Aromatic Spirits of Ammonia every three hours until improvement is shown by the appearance of appetite and ruminature, or "chewing the cud."

### Cow Needed Surgical Aid.

*I had a young cow which became bound up and there was no passage of the bowels for several days. Gave her two pounds Glauber's salts one day, one pound the next day, and one the third day. The cow died. What was wrong with the treatment?*

Your treatment for constipation did no harm, and will often do good. In future use Epsom salts instead of Glauber's. Your animal had an impacted rumen and surgical interference would have been the only means of saving her.

### Swelling on Heifer's Head and Shoulders.

*I have a cow that will not eat. Her head, neck and shoulders are swollen. She is a heifer with first calf.*

This appears to be the result of a poisonous bite. Paint swellings with tincture of iodine. Give internally the following: Fluid extract nux vomica, eight drachms; alcohol enough to make one pint. Give two ounces three times a day until gone.

### Cows Have Vaginitis.

*What about cows running with the bull all the time and being in heat all the time? They have calved from time to time, but it seems to me that something must be wrong, either with the bull, or the cows have some disease. I have examined two of them, and found the womb swollen to the size of a medium sized rose and very red as if irritated, and discharging a slimy stuff.*

Your cows have vaginitis. Take them away from the bull and irrigate their vaginas once daily with 1 per cent creolin solution for two weeks. In the meanwhile, wash out the bull's sheath with this solution daily for the same period. Do not turn the animals back with the bull until the discharge has ceased.

### Infection After De-horning.

*One of my dehorned cows is sick with foamy and bloody matter running from the holes of the horns. I would like to know what is best to do for her.*

Your cow's stubs have become infected. Thoroughly syringe out the holes twice a day with the following: Liquor Cresolis Compositus 2½ drachms, water 1 pint. Cover all stubs after dehorning with Stockholm tar, which is protective and antiseptic.

### Symptoms of Tuberculosis.

*About a month ago my five-months heifer had a bad cough that came on in spells during which she had a hard time to get her breath; her mouth would fill up with phlegm or saliva. The cough is hollow and deep and as I have fed her some hay containing foxtail grass, wondered if she could have got one into her lungs. Her general health seems fair, appetite fair, etc.; only recently she seems to be getting dull and a little poor.*

This cow should be tested for tuberculosis.

### A Case of Anthrax.

*A neighbor of mine lost a cow suddenly a few days ago. He cut the carcass open to see what was the matter, and found the spleen terribly swollen twice its natural size, the lungs swelled almost to bursting, the intestines covered with some loose matter that he could scrape off with his knife, as if the surface of the intestines were rotting or getting dissolved in some peculiar way. Every organ was affected in some way, too large or inflamed or peculiarly colored. Can it be anthrax? There is no swamp on his farm.*

The cow died of anthrax. Although your description of post-mortem appearances is not absolutely characteristic, still it is typical enough to warrant this diagnosis. Have him vaccinate the rest of his herd immediately. However, do not vaccinate any of his sick animals, or those showing symptoms, such as high fever, as vaccination will not save them. Separate all sick from healthy animals, and disinfect barns. It is not necessary to have swampy ground to have land infected with anthrax.

### Occurrence of Anthrax.

*You say that prevention of anthrax "consists of vaccination before the period or time at which it usually breaks out." Does this imply that after this disease has once appeared in a place, it remains, so that we may expect a new outbreak every year?*

Once soil becomes infected with anthrax it stays for an indefinite period of years. However, cattle may graze on infected premises during winter and spring without becoming infected, as the disease does not usually break out till summer or fall. Thus by vaccinating them in late spring, they become immune before the time the disease usually breaks

out. Different localities usually show different periods for the outbreak of anthrax which may also be governed by that particular season, which may be late or early. Vaccination gives an immunity for about one year, so that on infected soil animals should be vaccinated early.

### Bloody Murrain Is Anthrax.

*State what bloody murrain is, how it acts, what the cause is, and the cure.*

Bloody Murrain is an old name, not used at present, for anthrax. It acts as an acute septicaemic and is caused by the germs bacillus anthracis. There is no cure. Prevention is the only means of combating this disease, which consists of vaccination before the period or time at which it usually breaks out.

### Sudden Death of Heifer.

*A heifer of mine had a stiff walk and hung her head down. She had no appetite whatever. I gave her a good physic but it did not affect her and she only lived about twelve hours after I discovered she was sick. Now I have another taken in the same way.*

Give your heifer the following: Quinine sulphate 4 drachms; fluid extract belladonna one-half ounce; fluid extract digitalis one-half ounce; spirits nitrous ether, four ounces; alcohol four ounces; syrup enough to make one pint. Give two ounces every three to four hours until gone.

### Growths on Neck.

*My cow has on top of neck, one-third of the way from head to shoulders, a bunch of grayish growths from size of pea to inch in diameter. They seem painful under pressure.*

These are papillomata, due to some local irritant. Snip them off with a sharp pair of curved scissors after washing with lysol water. Apply tincture chloride of iron once daily to the spots.

### Turpentine for Bloat.

*I am given this treatment for bloat: "Take two tablespoonfuls of turpentine; put into bottle of warm water; drench the bloated cow with it and in a few minutes she will be all right."*

You will find the turpentine very efficacious for bloat, only increase the amount three times.

### Fox-Tail Swelling.

*I have a cow that had a fox-tail in her throat which caused a swelling back of the jaw. It was lanced, but perhaps not lanced deep enough. The core is very hard, and there is another core about half way up on her neck.*

Take a sharp-pointed knife and lance the hard cores you speak of. After pus has escaped, syringe out cavities daily with a 2 per cent solution liquid cresolis compositus.

### Effects of Abnormal Birth.

*With one of my cows the calf came, two weeks ago, hind feet first and dead. The afterbirth came three hours after calf was taken, but she has quite a lot of bloody discharge yet. Could you tell why her calf came as it did, and is she apt to have all of her calves the same way? I think the first calf came the same way. Is this discharge for two weeks natural?*

The discharge is not natural. Irrigate her vagina and uterus with two gallons of a one per cent potassium permanganate warmed to body temperature once a day for one to two weeks, or until discharge ceases. Also give internally two drachms of potassium iodide twice a day. Dilute this in water and give for one week. A normal presentation is either fore feet and head or hind feet. Some animals for unknown reasons never present normally again; it is the exception with others.

### Lazy Bull.

*A bull will follow cows in heat, but will not attempt to cover them.*

Yohimbin in five-sixth grain doses three times a day would undoubtedly overcome this trouble; but it is sometimes hard to get and expensive. Try fluid extract of nux vomica in drachm doses three times a day until he shows great nervousness and keep him away from the cows for a couple of weeks.

### Bull's Tongue Swollen.

*My bull developed a swollen tongue. The root is all right, but from the base out the bull seemed to have no control of it. It is hard, but no sign of abscess has shown. It is hard for him to chew his cud and to drink.*

This is Actinomycosis of the tongue, sometimes called "wooden-tongue." Put the animal on potassium iodide given in two-drachm doses three times a day on an empty stomach. Dissolve this in water. This is the only drug which has a specific action on this trouble.

### Bull With Tuberculosis.

*I have a bull that is out of condition, and while I have had two veterinarians examine him they did not do him much good, and he still coughs. For the past couple of days he has thrown blood out of his nose. He has been sick over two months, but seems to eat fairly good. Is there anything that can be done for the animal?*

It looks like a well-advanced case of tuberculosis and the animal cannot live long. It seems extraordinary, however, that two veterinarians have treated him if he was suffering from tuberculosis. Of course an examination would be necessary to determine the facts. An animal in the condition which you describe would probably not react to the subcutaneous tuberculin test.

### Preventing Self-Abuse.

*Advise me what to do for a bull that masturbates.*

This is a bad habit to break an animal of. Mechanical means are the only methods which offer any hope of results. Prevention of erection or pain on erection are the two methods open to use. A sack-like wire screen held in place over the penis by girths and straps answers the purpose of the former method, while the latter method may be accomplished by making a leather pad through which nails are driven and holding this just in front of the penis with the sharp points projecting downward.

### Cow Pox.

*One of my cows has small sores on her teats and bag, which look as though the skin had been knocked off. It dries and forms a light scab. Before it becomes a sore, there appears a red spot under the skin.*

Your cow has cow-pox. Give a physic of glauber and epsom salts mixed 4 ounces of each to a heifer and double the dose to a cow. Apply externally, once daily, after washing, the following prescription: Zinc ointment 4 ounces, iodoform ½ ounce, glycerine 2 ounces, carbolic acid 2 drachms. Mix thoroughly and apply to sores. Applications of carbolated vaseline are also approved.

### The "Horn Fly."

*Tell when the horn fly was first brought to California and how to keep the flies from cattle.*

The horn fly was imported to America from Europe about 1887. Spraying the cattle with anti-fly remedies is good; or brushing the surface of the hair with a mixture as follows: Cut some pine tar with an equal amount of kerosene and then add as much fish oil as of the kerosene. They breed in fresh manure. Spread the manure out so it will dry quickly or keep it under close cover.

### Wash Against Flies.

*Tell me how to make a good application to keep the flies off and leave the hair on horses and cows.*

One recipe is: Fish oil 1 pint, liquor cresolis compositus, 4 ounces, neutral oil enough to make one gallon. The U. S. Department of Agriculture recommends the following: A mixture of fish oil 1 gallon, oil of pine tar 2 ounces, oil of pennyroyal 2 ounces, and kerosene ½ pint; applied lightly but thoroughly to the portions of animals not covered with blankets or nets. Repeat often as the flies bother.

### Fly Knocker.

*What is a good fly knocker for a cow?*

A can of carbolineum will last a long time and is a good fly-knocker. Moisten a cloth with a little and wipe it over the cow. The flies will give her lots of room.

### Warbles.

*I have a young heifer whose back is full of swellings containing grubs of the botfly. There is not a single one on the cows.*

Your heifer is troubled by the grubs of the Hypoderma Lincata, or ox warble fly. This fly lays its eggs on the heels, shoulders and belly of cattle, where they hatch in twelve days. The larvae irritate the skin, causing itching, which spots the animal licks, picking up the larvae on the tongue and swallowing same. The larvae then burrow through the walls of the oesophagus and up into the muscles of the back under the skin, where they hibernate, develop and pass out in June, July and August. The grub falls to the ground and in thirty and forty days becomes a mature fly. Crude pine tar, smeared over the heels, belly and shoulders every twelve days, will kill the larvae and expel the flies. Grubs already lodged in the back should be squeezed out or killed by the injection of a few drops of turpentine into the abscess. Young animals are more susceptible than the older ones for the reason that their skin is more sensitive to the itching caused by the larvae and is, therefore, more often licked.

### Cleaning Up Cattle Ticks.

*My son in Guatemala has a good deal of trouble with ticks on the cattle and wishes some formula for dipping and washing cattle to make them free of the pest, and also which would be the best way to destroy them in the pasturages.*

The variety of tick infesting the cattle would determine the exact method of eradication, as its life history is the all-important factor in prescribing special treatment. The following is an outline for Texas Fever tick eradication and the same dips will kill all kinds of ticks: Arsenious acid 10 pounds, carbonate of soda 24 pounds, soap 24 pounds, oil of pine tar 1½ gallons, and water enough to make 500 gallons. Boil the arsenious acid and carbonate of soda in 50 gallons of water for two hours and add the remaining ingredients. An ordinary dipping vat should contain 2,000 to 5,000 gallons. Have your cattle well watered and rested before dipping. Drain the cattle where there is no vegetation and rest an hour after dipping. By dipping all the cattle every twenty to thirty days, all ticks on the property will become exterminated in one year. Or divide the property with fences and keep all animals off a subdivision for eight months, which will clean that piece of land by starving the ticks. Dip all cattle before returning to rested land twice in ten days. In this way all land on a property can be cleaned up.

### Ear Ticks in Cattle.

*Most of the cattle in this vicinity are infested with ear ticks. It breeds and develops only inside of the animals' ears, and it seems they are on the increase. While no loss of cattle has occurred so far, this*

*tick causes annoyance to cattle. We use diluted sheep dip to try to get rid of them.*

The only disease-bearing tick fatal to cattle is the one which is the carrier of the organism which causes Texas fever. At present California is supposed to be free from this trouble. The Texas fever tick attacks all parts of the body. Send samples of your ticks to the State Veterinarian, Sacramento, for identification. You will find the following a better preparation to remove ticks than you are using: Kerosene 1 gallon, cotton seed oil one gallon, sulphur one pound. Smear this over ticks as often as it becomes necessary.

### Cattle Have Herpes.

*I have young cattle on which there comes a scab or wart growth about the eyes, head and throat. They scratch or rub the affected spots a great deal. Some spots are almost as large as a man's hand and the surface is quite rough and hard.*

Your cattle have herpes. Isolate all affected animals, as it is catching, and disinfect all rubbing posts and houses where they have been. Use a warm 1 per cent creolin solution to wash off and loosen scabs and crusts, and paint the affected areas of the skin with tincture of iodine once daily, being sure to thoroughly cover the outside edges of the affected areas. Try and prevent animals from scratching and rubbing as much as possible. In about one week after treatment is begun, discontinue the tincture of iodine, and apply iodine salve as needed.

### Ring Worm.

*I have a cow which has been licking her nose more than usual. I find that she has little brown rings all over her nose resembling ring worms. The cow is in fine condition. I also have a sorrel horse which has sores all over his body, especially on the head. They are under the skin, and rise up in lumps and come off in scabs, bringing hair and skin with them. They average about an inch or more in diameter.*

Both your cow and horse have ring worm. Wash affected parts well with warm soap and water, then apply tincture iodine daily for one week, after which apply vaseline to the part once or twice to keep the skin soft.

### Oleander Poisoning.

*Three cows took sick Thursday, one died Sunday and one on Monday. They did not seem to suffer pain, but stood and lay around part of the time, not noticing anything. Nothing passed through them. They did not bloat. The veterinary opened both of them and found everything normal. The day before they took sick we fed them some lawn clippings, and there were a few oleander sprouts with the grass. If the oleander was poison, could not a veterinary detect it?*

The cows died of oleander poisoning. The lesions found on autopsy are not characteristic and are often almost entirely absent. The symp-

toms you describe, however, are characteristic. One oleander top will usually produce death in cattle and horses. There is no specific antidote and cases must be treated symptomatically.

### For Pigs With a Cold.

*My pigs cough a little and run at the nose. They seem in good health, are on natural pasture and forage practically all day, and eat heartily of the grain feed twice a day.*

For the colds which your pigs have, give the following: Quinine sulphate 1½ drachms, pulverized nux vomica 1 drachm, pulverized ammonium carbonate 2 drachms, pulverized camphor 1 drachm, pulverized potassium nitrate, 3 drachms, pulverized gentian root 3 drachms. Make this into twelve powders and give one powder twice a day in molasses.

### Coal Screenings for Hogs.

*Are coal screenings good for hogs? Can you suggest anything better?*

Coal screenings are good for hogs. A better form of carbon for pigs, however, is charcoal.

### Pig Breathes Hard.

*I have a pig two months old that breathes very hard. His nose is some swollen and a faint odor comes from it. The pig is still sucking and eating skim milk and rolled barley; is in good form except a rough coat.*

Your pig has a foreign body lodged in his nostrils. Remove it, carefully using a piece of baling wire with a ball of cotton twisted on the end. Turn and twist until substance catches on the cotton. After treatment would consist of syringing out nostril with 50 per cent solution peroxide of hydrogen.

### Intestinal Catarrh.

*A pig about four months old has but little control of his hindquarters. He eats well, but does not digest well, for he has diarrhoea. He has been in this condition for some time.*

The hog has gastro-intestinal catarrh. Feed but once daily and give only light food such as bran mash. Give two-ounce doses of epsom salts twice a week and use the following: Bismuth subnitrate 4 ounces, zinc sulphocarbolate 4 ounces, soda bicarbonate 8 ounces, iron sulphate 6 ounces. Mix together and give two ounces twice daily.

### For Protruding Rectum.

*The inside of the rectum of my three-months-old pig protrudes like a telescope till it projects two or three inches from rump of the pig. The pig has been this way for a week. I used carbolic acid as a dis-*

*infectant. I have difficulty in keeping her bowels loose and she has pains in excreting. What is the cause of this and how shall I treat the pig?*

Give pig two to six ounces epsom salts, depending on size, as needed to remedy this trouble. On the prolapsed rectum use the following ointment: Adrenaline and chloretone ointment (P. D. Co.) applied twice daily. Before applying the ointment, hang pig up by hind legs and give injection of warm soap and water to reduce the prolapse, then insert finger and apply the ointment.

### Pig With Inflammation of Kidneys.

*What is the matter with a pig that urinates almost constantly, usually small stream; at first natural in appearance; now, after five days, considerable quantities of blood, bright red? The pig lies down on his belly most of the time. When standing, back is humped.*

This is inflammation of the kidneys. The best remedy is to butcher the animal. You might try giving flaxseed tea twice daily in one pint doses, also one drachm potassium citrate twice daily.

### "Thumps" in Pigs.

*I have young pigs that cannot stand still. They shake like a pig does when he is cold.*

Your pigs have the thumps. Cut their ration in half. Give each 2 ounces epsom salts, then 2 drachms aromatic spirits ammonia every two hours until relieved.

### Scabby Hide of White Pigs.

*Tell me a good way to keep scabs off my white pigs. Does undiluted coal oil sprinkled on them to kill lice hurt the pigs?*

Undiluted coal oil is too severe to use on animals; a little crude oil painted on their backs and behind the ears is far better. White pigs blister and become scabby in our California climate, and is one of the main reasons why black hogs are more popular in this State. Provide plenty of shade for them and a clean cement wallow, containing a 2 per cent solution of liquor cresolis compositus, on which is floated about one-half inch of crude oil. Allow them free access to this at all times. Clean out this wallow at least once every two weeks and put in fresh solution. This will not only act as a healing lotion for their scabs and sores,but will also keep them free from lice and help prevent other diseases.

### Pigs Die From Infection.

*When our pigs are born, they are in a good, healthy condition; at the age of five days or over they scour very bad, and get very thin; they suck the mothers very little; they always lay sideways for about five*

*or six days until they die. The sows' food consists of skim milk, dairy chop food, and rice middlings.*

Your pigs became infected with the organism Bacillus Coli communis. Wash the sows' udders with a 2 per cent solution liquor cresolis compositus once a day. Disinfect your premises. Give pigs one tablet Abbott's sulphocarbolates compound once daily. It would also be a good plan to cut down the sows' rations considerably.

### Pigs Lame From Foot Rot.

*Some of my pigs get lame in their hind feet. They seem to walk on the back part of their feet with the toes sticking up off of the ground. Then a few days later the ankles get scabby. The hoofs turn a reddish purple, like a mashed thumb nail, before they get lame. I notice some with their noses peeling off, but they still have good appetites.*

Your pigs have foot rot caused by the organism bacillus necrophorus, which lives in mud and water. Put animals in dry surroundings. Make a trough deep enough so that when standing in it, the affected parts of the feet will be covered. Make animal stand in this containing a 2½ per cent cresol solution for five or ten minutes. Take a swab and wipe off their noses with this solution. Afterwards apply pine tar to the affected parts.

### Mangy Pigs.

*Tell me a good remedy for a kind of mange in pigs? Their skins seem to get thick and wrinkled and itchy, the hair standing straight and mostly falls out.*

This is mange. Make a dipping tank and dip these pigs twice a week in a 2 per cent solution liquor cresolis compositus covered with ½ inch crude oil twice a week.

### Pigs Smut-Poisoned.

*Several young pigs lose the use of their hindquarter, are weak across the back, try to get up and roll around. When they finally succeed in getting up, go staggering off, and if excited roll over some more. Am feeding ground barley that has smut in it. Can that affect them?*

This condition is due to poisoning from the smut on the barley. Young pigs are very susceptible to forage poisoning of many kinds.

### Foxtail in Pigs' Eyes.

*The eyes of pigs, ten weeks old, are swollen and have sores around them. Four weeks ago one of the pigs got a foxtail in one eye and I pulled it out. I cannot see any more foxtails.*

Some of the foxtail remains. Remove the cause and bathe several times daily with boric acid solution.

### Skin Disease of Pigs.

*My little pigs get nice and fat, then in about two weeks they become scabby, sores forming, and finally die. I have kept litters from mudholes.*

The pigs have infectious dermatitis. Dip them every other day in a two per cent solution of liquor cresolis compositus. Disinfect their quarters with the same strength solution.

### For Worms in Pigs.

*What is good for worms in pigs? They have charcoal and salt always before them.*

It is wise to suspect worms in pigs at all times. Place some powdered iron sulphate where they can have free access to it.

### Stale Milk Injures Hogs.

*Two of our sows died suddenly and the rest in the lot got a black diarrhoea. They are on pasture, received a little ground feed and separator skim milk hauled in a wooden tank, night's and morning's milk mixed. The milk tank in which it was hauled to the hogs was formerly not cleaned at all, but lately we scrape it out once in a while and wash it out with clear cold water.*

There is no doubt that the stale milk adhering to the sides of the tank putrefied and contaminated the fresh milk put in. This caused ptomaine poisoning. Keep the tank absolutely clean and you will avoid future trouble from this source.

### Sow Does Not Breed.

*I have a sow sixteen months old and has never been with pig. She seems to come in heat regularly and has been bred five times by three different boars. We did not breed her until she was twelve months old. She is in real good condition.*

This sow either has a growth in her genital tract or is troubled with leucorrhea. An examination would be necessary to determine the exact trouble. Try douching her vagina once daily with a 1-1000 solution potassium permanganate.

### Helping a Sow to Breed.

*My sow is four years old, and raised several nice litters. The last time she took the boar it did not bring her with pigs, and since that date she has never been in heat. She is fat, and seems to feel good.*

Give the sow the following: Fluid extract viburnum prunifolium in two-drachm doses twice a day.

### Home-Made Hog Tonic.

*Parties are traveling through the country selling a very marvelous tonic for hogs at a marvelous price. Could not farmers procure the*

*ingredients and make the compound themselves at about one-sixth the cost?*

The recipe for the tonic is given by the United States Department of Agriculture as follows: Wood charcoal 1 pound, sulphur 1 pound, common salt 2 pounds, sodium bicarbonate 2 pounds, sodium hyposulphite 2 pounds, sodium sulphate 1 pound, antimony sulphide 1 pound. These ingredients should be completely pulverized and thoroughly mixed. The dose is a large tablespoonful for each 200 pounds weight of hogs to be treated.

### Water Puffs on Pigs.

*Three or four of a litter of eleven pigs two weeks old have puffs or bags under the skin of their backs filled with a water-like substance. They are well otherwise and have good appetites.*

These cysts appear at times on new-born animals probably due to malformation. Open them at the lowest point so as to give drainage and paint their inner lining with tincture of iodine once a day until healed.

### Eating Hogs After Vaccination.

*When, after vaccination for hog cholera, can I kill with perfect safety for bacon, lard, etc.? The hogs have always been perfectly healthy.*

Hogs are all right to kill and use for meat twenty-one days after vaccination. At that time they have cleared up and will pass the government inspection at abattoirs.

### Rheumatic Pigs.

*I have sixteen pigs, seven weeks old, in good health, get all the skim milk and middlings they can eat, have dry houses to sleep in and floored outside runs to keep them out of the mud. But one of the pigs is lame in the left front and hind feet, and the others are beginning to be so.*

Your pigs have rheumatism, to which swine are very liable. Be sure to see there are no cracks in the floor or house through which drafts may enter. Use good dry straw for bedding. Give each pig a teaspoonful of epsom salts daily for three days, then 5 grains sodium salicylate twice daily until lameness disappears. If pigs go off their feed, discontinue treatment for a few days and then resume.

### Pigs With Inflammatory Rheumatism.

*We have some shoats five months of age that get weak in the hind legs; the second joint is more or less swollen; they eat and drink always, but can't stand on the hind legs. They also vomit the food more or less. When standing they continually tramp on their feet.*

Your pigs have inflammatory rheumatism. Provide good, dry sleeping quarters for them, free from draughts. Paint the swollen joints with tincture of iodine once daily. Give them internally one five-grain tablet sodium salicylate twice a day in their feed.

### Pigs Dwindle Away With Pneumonia.

*I always lose some young weaned pigs. They have a cough and dwindle away but eat almost to the last. I feed warm skim milk from the separator and green forage.*

Your pigs are troubled with chronic pneumonia caused in most cases by insanitary surroundings and overcrowding during these cold nights. Provide warm, dry sleeping quarters free from drafts.

### Pigs Scouring.

*Four pigs about a month old have dysentery. The mother lost her milk when they were a week old. We feed warm sweet milk night and morning.*

Give these pigs one 30-grain tablet Abbott's Sulphocarbolates each, three times a day, until diarrhoea is under control.

### Pig With Fistula of Shoulder.

*A young hog six months old, has been bruised by a bite of another hog on the shoulder blade at the top. At first it swelled up and looked as though it wanted to run. I lanced it and quite a bit of pus came out. It was all right for a while, but swelled again. I lanced it again about one-half inch deep and cut it two inches wide, but found no pus. What I cut through looked like fat. The lump is about the size of a small china cup.*

The pig has a fistula of the shoulder. The fatty tissue is not normal and must be removed. An operation is the only satisfactory means to effect a cure. Consult your nearest veterinarian.

### Pigs With Lung Plague.

*About a month ago some of our pigs began to get thin and cough. Their eyes got sore and would close. Breathing seemed to be very difficult, and they became very weak in their hind quarters; some would wobble so badly that they fell down. They would act this way for a few weeks, then die. They ate very well up till a day or so before they would die. In post mortem examination everything seemed all right except their lungs, which would be very much discolored in spots, or the whole lung would be almost black or rather blue, and inside there would be a sore spot of a white froth-like matter.*

Your pigs are affected with lung plague, which is an infectious, contagious disease. There is no cure, and prevention is the only means of combating the trouble. This consists of hygienic and sanitary surroundings. Separate the healthy animals from the sick ones. Provide good, dry sleeping quarters free from draughts. Place the following substances in containers where animals can have access to them: Powdered iron sulphate, salt, potassium nitrate, powdered charcoal, and slaked lime. Disinfect your premises with a five per

cent solution liq. cresolis compositus. Dip your pigs once a month in a two per cent solution of the same, covered with one-half inch crude oil.

### Sow Partly Paralyzed.

*We have a sow that we expect to farrow in a week or two. She has had the same care as the rest of the sows, about sixty in all. She has lost the power of her hind legs. Have given her a good rubbing over the kidneys and legs with liniment; does not seem to do her any good.*

Your sow's paralysis is due to her condition. She will probably recover after farrowing. The condition is ascribed to pressure on the nerves and blood-vessels of the pelvis. This pressure is removed after parturition. Give her plenty of clean, dry bedding and keep her comfortable. It is a good treatment to give her two ounces Epsom salts every two to four days as long as the paralysis continues.

### Sow Paralyzed.

*My brood sow about a year old has lost all her strength in her back quarter; she is not able to walk at all. She was bred about three weeks ago; she is in a good condition.*

This is paralysis due to her pregnant condition. Give her twenty grains potassium iodide three time a day before meals.

### Ulcers on Sow.

*What can I do for a young sow which seems to have ulceration on and in the vagina?*

Get a human rectal syringe and inject the following, twice daily, being sure to keep parts clean: Liquor cresolis compositus two and a half teaspoonfuls, water one pint. Sprinkle the surface ulcers afterward with the following: Boric acid one ounce, zinc oxide one ounce, alum one dram, thymol iodide one dram. Put this powder on with a salt shaker.

### Hogs With Lice.

*I have some sows with young pigs that are covered with lice. I have them in small individual pens, under cover. The pens have board floors, which are cleaned, and bedding changed three times per week.*

Thoroughly spray your pens and houses with sheep dip. Get some crude oil and heavily paint the backs of mature animals, being sure to coat the region behind the ears. Do this once a week and your pigs will soon be free from lice. Another good method is to construct a wallow or bath, keeping the water covered to a depth of one-half an inch with crude oil, and allow your animals free access to this.

### Wound on Hog's Leg.

*I have a hog that gave out in one front leg two weeks ago. Some days she moves around and feeds; others she lies around. When*

*she walks, she holds up one leg. I noticed on inside of leg about the knee two natural looking holes that seem to keep moist.*

Wash leg off thoroughly with warm soap and water and examine to see if there is a foreign body, such as a nail or splinter, lodged in it. Paint affected part daily with tincture of iodine. Give internally one dose of four ounces Epsom salts.

### Stomach Tumor in Sow.

*After a sow died we found a growth nearly the size of a person's head in her stomach. This seemed to be rather hard and like gristle with a red streak through it. It seemed to have grown from the large intestine.*

The hard growth you mention was a tumor. These growths appear without apparent cause and do no damage until they interfere mechanically with the vital functions.

### Hog's Feet Crack.

*I find several of my hogs, running on alfalfa, have sore feet which crack up and bleed and get so lame they cannot walk. The hoofs become a pinkish, red color.*

The trouble is caused by the bacillus necrophoras. This germ lives in water and mud, contamination of which produces the trouble you have. Give animals internally ten grains potassium nitrate for each 100 pounds live weight, two or three times daily in feed. Make animals stand in three per cent solution creolin for five to ten minutes twice a day. Disinfect mud holes and wallows with a five per cent solution creolin.

### Boar Weak in Legs.

*A boar 14 months old, has been weak in the legs for the past three weeks. We feed skim milk, steamed barley, middlings, charcoal.*

The boar's trouble is digestive. Give him four ounces Epsom salts. Have the following put up in twelve powders and give one powder three times daily: Dried iron sulphate, one drachm; quinine sulphate, one-half drachm; nux vomica, one and one-half drachms; gentian root, three drachms; potassium nitrate, one and one-half drachms.

### Erysipelas in Hogs.

*We have lost hogs from what some veterinaries call "cholera," some call it "erysipelas," some "pneumonia." What does your veterinary say about the symptoms of "erysipelas" in hogs?*

Erysipelas in hogs takes three forms. (1) Urticaria, the mildest form. After 1-2 days there is a general disturbance of health. There are sharp circumscribed swellings on various parts of the body dark red or violet in color. The center may become pale, but the borders retain their bright color. The temperature may rise up to 109 F.

There is dullness, loss of appetite, thirst, constipation, inflamed eyes, and at times paralysis and nausea. The eruptions usually disappear after two to three days and the animal recovers. (2) Erysipelas Septicemia, the most frequent form. Sudden cessation of normal condition. Lie exhausted and do not resent handling. There is loss of appetite and vomiting. Temperature rises up to 108 F. and remains constant. Eyelids swollen and discharging. At first constipation then diarrhoea mixed with blood. Reddening of the skin rarely appears earlier than the second day. Exceptionally death results at the end of the first day or only after eight to nine days. (3) Chronic Erysipelas. Appears like the acute form. At first there is an apparent improvement, but later the symptoms manifest themselves again and death usually results.

### Enlarged Thyroid in Sow.

*A young sow had what seems to be a lump about the size of a peach pit in her throat a few weeks ago. Since then she gets the food to her throat and then coughs it up. It is more like a growth now, is quite long and has grown fast to the flesh. Could it be cut out?*

This is an enlarged thyroid. Paint it with iodine once daily for a week.

### Sheep With Nasal Catarrh.

*What is the cause of nasal catarrh in sheep; also the cure?*

Coryza (acute nasal catarrh) is due to any local or general irritant. If the animal is not sick, inhalations of Vapo Cresoline or local applications of saturate boracic acid, several times daily. It may be caused sometimes by pasturing on alkali pastures if it is general.

### Bronchial Worms in Sheep.

*We have sheep running in a small pasture. We kept water for them in a trough, but they seemed to prefer to drink from the canal or low place in lot. Two have died and one is sick. It was running at the nostrils badly and finally began to bleed.*

From the symptoms given, your sheep probably have verminous bronchitis. However, the diagnosis had better be backed up by a graduate veterinarian. If worms or ova are found in the nasal discharge the diagnosis will be positive. Remove all sheep to fresh pasture and allow them water from a clean trough only. The trough should be emptied and disinfected daily with a five per cent creolin solution. All animals should receive an injection with a hypodermic syringe in the trachea, with the following: Oil of turpentine and olive oil each 100 parts, Pearson's creolin 10 parts. Inject one drachm into the trachea of each animal and repeat in three days.

### Lameness in Sheep.

*Some time ago one ewe got lame in one front leg and later on she got quite stiff in all four legs. Then a yearling wether got the*

*same way. Then another ewe went lame in one front leg and today she can hardly use her front legs. Two sheep have died.*

The trouble is due to an organism called the Bacillus Necrophorus, and is usually caused by infected mud or water. Keep your sheep on a hard, dry floor until the ground dries up. Let them stand for thirty minutes in a warm two per cent solution of creolin daily for a few days, washing and scrubbing feet and legs thoroughly.

### Mite in Dog's Ears.

*I send a bug we find in our pet dogs' ears. It bothers them very much until we get them out. They are in in the winter as well as summer.*

Your dogs are troubled with a mite. First clean out and syringe with a two per cent carbolic acid solution and dry thoroughly, then inject the following: Napthol, 20 drops; sulphuric ether, 1 drachm; olive oil ½ ounce, and close the opening for fifteen minutes with cotton.

### Dog With St. Vitus Dance.

*My shepherd dog had distemper this spring. He seems to be all right except his front legs and neck. His head keeps jerking, and when he lies down it is just the same.*

Your dog has (chorea) St. Vitus dance. He will outgrow this in a few years. This is secondary to distemper.

### To Cure Mange on a Dog.

*My pet dog has some kind of skin disease. His skin is very red, like fire; and he is itching and scratching all the time; has holes on his back and tail.*

The following treatment carefully carried out will cure your dog. Internally give one ounce castor oil and one ounce syrup of Buckthorn mixed together. After this purgative has acted, get one-half ounce Fowlers Solution and give five drops of this twice daily until gone. The above doses are for dogs weighing about forty pounds; doses in proportion for other weights. Externally give dog a good bath in hot soap and water, using a brush and being sure to scrub off all scabs and scales. Then immerse animal in a lime sulphur dip for five minutes. This is composed of lime eight parts, sulphur 24 parts and water 100 parts. Your druggist can make this for you. Repeat the bath and immersion in the sulphur dip three times at intervals of ten days. After the bath, thoroughly dry the animal and apply and work in thoroughly all over the skin the following, which your druggist can make up for you: Oil tar, one ounce; flowers of sulphur, one ounce; oil cajuput, one ounce and neutral oil, enough to make one quart. Keep the dog on a light diet.

### Mange or Ringworm on Dog.

*Mange is just starting on a fox terrier, being a spot about as big as a dollar. Shall I keep him away from the children?*

Apply the following lotion to affected parts, once daily for three days; and on fourth wash with soap and warm water. Lotion: 3 ounces sublimed sulfur, 4 drams of oil of tar, 2½ ounces of liquid petroleum. Do not apply to more than one-quarter of the body at a time in any case, but as this is just starting and only in small patches, this warning is scarcely necessary. Keep the dog away from the children as you cannot be certain that the affection is mange. Other parasitic diseases, such as ring worm, are easily communicable to the human.

### Chronic Constipation in Dog.

*I have a valuable dog with what appears to be chronic constipation. The obstruction seems to be located at the rectum. So far we have been able to relieve him. We use an enema of warm water and soap. He also manages to take it from himself.*

Give this dog two ounces of castor oil. Follow this with one tablespoonful of hydrocarbon oil daily. This is a great reliever of chronic conditions of this kind.

### Swelling on Dog's Jaw.

*Our bull pup has a growth under his lower right jaw. Three days ago was no larger than a small pullet's egg, and is enlarging rapidly. It is movable and does not seem to pain when touched.*

This may be an abscess or may be an enlargement of one of the submaxillary glands. Bathe and rub in a mild liniment such as the following: tincture arnica 1 ounce, spirits camphor 1 ounce, soft soap ½ ounce, stronger ammonia water ½ drachm, water to 8 ounces. When the abscess points it would require to be lanced and syringed out twice daily with a mild antiseptic, such as a saturated solution of boric acid. Pay attention to the animal's diet and feed only twice daily.

### Rabies in the Dog.

*How long does it take rabies to develop in a dog bitten by a mad dog? Would it be communicated to pups, littered one hour after the mother was bitten? What are certain symptoms?*

The period of incubation varies between fifteen days and two months, but cases are on record of longer and shorter periods. It could not be communicated to pups littered one hour after the mother had been bitten, provided of course they were not subjected to exposure to subsequent infection.

The symptoms are rather liable to be confounded with symptoms of other affections, except by a trained observer, but in general one may say the following are suspicious and where there is a history of a

dog having been bitten by a strange dog should be believed with decided suspicion. The first signs of both kinds of rabies (the "drunk" and the "furious") are the same and consist of a change in habit, as a dog inclined to be surly becomes affectionate and a dog of apathetic habits will become more active, but inclined to resort to dark corners, etc. There is no inclination to ferocity in the first stages: however, there is generally an increased nervousness and restlessness at this time. A depraved appetite is almost an invariable symptom at this stage. The voice is changed and has a peculiar note, once heard never forgotten. The popular idea that a dog is afraid of water is fallacious, as there is generally an increased thirst and the animal will drink freely.

### Belgian Does Refuse Buck.

*Four large Belgian hare does have persistently refused the black Flemish giant buck, one of them fighting and biting him. One other doe, bought already bred, had her young and was bred to this buck all right. Have left the others with him one at a time, sometimes as long as a week.*

Give your does yohimbine in doses of 1-48 grain three times a day for five days before they come in heat.

### Persistent Sore on Doe.

*My doe has an open sore at the base of one ear, on the outside, about the size of a dollar. It commenced months ago, with a lump that stuck out about the shape of a thimble. This after a while fell off, and seemed to be healed. Only lately it has opened up, and I can't heal it.*

There is evidently a foreign substance in this sore which has never been removed. Examine carefully and remove any foreign material. Then paint the wound once daily with pure tincture of iodine until healed.

### Rabbit Ear Scabs.

*What causes rabbits to have scabs in their ears and what is the best prevention and also cure?*

This is caused by the Dermatocoptic Scab Mite. Thorough disinfection of the yards and houses is the best preventive. Ordinary lime-sulphur wash used to dip sheep is a specific for this trouble.

### Lump on Doe's Shoulder.

*My doe kindled about three or four days ago. Now I notice a big, hard lump back of her right shoulder.*

This is an abscess. Lance it at its most dependent point and syringe out the cavity once a day with hydrogen peroxide 50 per cent strength.

### Rabbit Coccidiosis.

*What is the cure for coccidiosis in rabbits?*

There is no cure for coccidiosis. Prevention is the only means of combating this disease. The natural method of infection is by ingestion of food or water contaminated with the feces of rabbits affected with the disease. Young animals are especially susceptible while old animals are affected less seriously and as a rule show no symptoms, but are capable of infecting young animals by means of their feces. Separate young and old animals at the earliest moment. Destroy all visibly diseased animals. Hutches must be disinfected, kept dry and well ventilated. Particular attention must be paid to keeping their water pure and uncontaminated.

### Rabbits' Eyes Inflamed.

*My rabbits' eyes seem to swell and they have fever about the head; but they eat up to the time they die, and die in awful pain. They do not seem to have a cold, eyes do not run or nose; their eyes are the only symptoms.*

This is an infection of the eyes, which evidently causes inflammation of the brain. Thoroughly disinfect your pens weekly. Use boric acid in the eyes.

### Fleas on Rabbits.

*My rabbits have fleas on them. What is the treatment?*

Dust the rabbits with any good insect powder you would use for chickens. A good deal depends on the thoroughness of the job; you must go over the whole body, nose, ears, and eyes, as fleas will lurk in all these places.

### Sores on Rabbits' Feet.

*Sores come on the bottom of my rabbits' hind feet. At first there seems to be a small lump and in a short time the hair comes off of this lump; and then a thin skin peels off. This leaves the sore almost in the form of a blister, which gradually grows larger until nearly the whole bottom of the foot is affected.*

This is Necio Bacillosis. Disinfect your pens with a five per cent liq. cresolis compositus solution, as the disease is infectious. Paint the sores on the rabbits' feet with tincture of iodine once a day.

# PART VIII. POULTRY KEEPING*

### Trespassing Hens.

*My neighbors across a line and across a highway object to my hens trespassing on their property. What is the legal solution of the difficulty? Must I do all the fencing? If I choose to do nothing, what legal redress have they?*

You have no right to pasture your poultry on other people's property. It may be a benefit to them and they may allow it, but, if they have objected, you are notified to take care of your stock and you have no redress if they should take the shotgun. In the larger animals the aggrieved person has to catch and impound the stock, according to the laws of procedure, but we imagine no laws require an aggrieved owner to catch trespassing hens. If you do nothing you will probably have some dead birds thrown over your fence, and you might also be sued for damages.

### Marking Hens and Chicks.

*I have two strains of Plymouth Rocks, and I wish to keep the hens from one strain and the roosters from the other. How can I keep them apart? Is there any system of tagging which I can use to put on the little chicks until the time comes to segregate them?*

The best way is to buy a Pettit poultry punch, price 25 cents, at any poultry supply house. Punch a hole in the web of the foot of each chick; one in web of right foot, and the other in the left foot. This is better than bands, for the chick's leg outgrows the band. Keep an eye on the holes and keep dirt out; for sometimes they close up. You can mark at least five generations of chicks with that 25-cent punch. For instance, the first batch would not be punched at all, the second bunch on the inside of the left foot, the third bunch on the inside of the right foot and so on. If bands are used, first put on a small band which will be large enough for three or four weeks. After they have outgrown this size a larger should be put on which will not have to be again replaced unless lost.

### Chicks Die in the Shell.

*My eggs are nearly all fertile, but the chicks die in the shell. I find when using the eggs that the shell will peel away from the inner skin because of the toughness of the latter.*

*Answers in Part VIII are chiefly by Mrs. Susan Swaysgood, author of "California Poultry Practice" (published at $1.00, postpaid, by Pacific Rural Press) and by George H. Croley, President Federated Poultry Association of California.

The trouble is dryness. Try making the nest on the ground with a covering of straw or hay to lay the eggs on. If the ground itself is dry, moisten all around with plenty of water. The moisture from the surrounding earth will penetrate to the nest, but if it does not you need not be afraid to take the eggs out of the nest and pour warm water on the ground, then put the hay or straw back again and replace the eggs. The shells are too hard and tough. They need artificial moisture under hens just as with incubators, only not so much.

### Handling Runt Chickens.

*I have two-month chicks and four-fifths of the whole flock are as small as one month old. They simply stop growing while the rest are nice big chickens.*

The most probable cause is overcrowding in quarters at night. Remove the small ones to a pen and yard by themselves and feed them well, they will catch up, but if you leave them with the others they will not grow at all but will eventually sicken and die. Get them separated as soon as possible and they will pay for the trouble.

### Leghorn Standard Weights.

*What are standard weights for White Leghorns; also how much should a White Leghorn weigh at one month, two months, and three months?*

The standard weights for Leghorns are: Cock, 5 pounds; hen, 4 pounds; cockerel, 4 pounds, and pullet, 3 pounds. There are no standard weights for young chicks and growing fowls, but the following are approximate: Chick one month old, 5 ounces; two months, 11 ounces, and three months, 24 ounces. These weights are subject to great varieties for several reasons. Some strains of Leghorns will grow more rapidly than others; the weight will be influenced by the quantity and nature of the feed, and a number of other factors might affect the weight of the chick at the various ages.

### Air and Exercise for Chicks.

*I have a flock of 250 chickens in an 8x8 house, and I keep the temperature at about 85 degrees. When they are a week to over two weeks old they don't eat, and get down and are too weak to get up again.*

Fresh air and mother earth are what those chicks need. Get them out on the ground and induce them to run and scratch. If you can't get them to exercise any other way, boil a piece of liver tender, then cut it in very small shreds and throw down a few at a time until you get them interested. Keep your house warm so that when the chicks need to get warm they can do so, but get them out on the ground and in fresh air.

### Leg Colors in Small Chicks.

*What is the true color of legs of white Minorca chicks a week old? I received a shipment of chicks supposed to be white Minorcas and legs are bright yellow.*

The legs and down of all chicks vary. No one can judge what any chick is by these signs. The color of legs changes gradually up to maturity. Sometimes Orpington chicks come with yellow legs, but they always turn out a light pink or pinkish white, and that is the true color of the adult white Minorca. Wait, they will turn out all right in time if they are pure bred.

### How Far Are Trap Nests Useful?

*While visiting a number of poultry farms I was surprised to learn that very few breeders who formerly used trap nests continued with them, for more than a few reasons. The general opinion seemed to be that the trap-nested hen of high egg-producing ability could not be relied upon to produce pullets of great egg-producing capacity; and in numerous instances all their pullet progeny proved to be inferior layers.*

The poultry breeders referred to were not thorough in their work of trap-nesting or were lacking in certain knowledge that was essential to their success. The following brief remarks may start our enquirer in the right direction. Pullets do not become heavy layers simply because their mothers were great egg producers; therefore, the trap nest does little more than prove that the hen that has laid a large number of eggs has the capacity to digest large amounts of egg-making food and that she has a good circulation which insures vigor. She is able to transmit these qualifications for heavy egg production to her young of both sexes if mated to a male whose ancestors have possessed the same qualifications. On the other hand, if the male is from a mother who was able to produce only a limited number of eggs, he will, in nearly all cases, influence the laying capacity of his pullets that come from his mating with a heavy laying hen, causing them to be poor layers while their brother cockerels are almost sure to inherit their mother's qualifications for producing many eggs, to be transmitted by them to their daughters of the next generation.

### Poultry Yard Shelters.

*I wish to plant some fast-growing trees or shrubbery to act as a windbreak around my chicken yards. The ground is light sandy soil.*

For an evergreen shelter, closing in near the ground, as is presumably desirable for fowls, nothing is better than the Monterey cypress. Small plants, set four feet apart, will close in the first year. As a lighter shelter with some edibility in the leaves, we prefer the "tree malva," (lavatera) which is grown easily from the seeds. The plant is very common in all valley and coast regions.

### Build Separate Chicken Houses.

*How shall I get chicken lice out of a combination chicken house and stable for horse? Horse is in danger of the lice and therefore keep him in yard in summer, but must have a stable in winter.*

Tear your chicken house down from the barn and rebuild it by itself, then spray it once a week with any of the commercial disinfectants on the market. It is very inadvisable to have a chicken house in connection with a building for any other purpose.

### Chicken House Capacity.

*We have built eight by sixteen poultry houses with dropping boards, so that the whole floor can be used as a scratching shed. How many chickens should each of these houses accommodate?*

Such houses will accommodate sixty Leghorns, and with the yards certainly should give good results. Do not use long houses, that is, joining several of these houses together. That plan used to be done, but it is about obsolete now. Have your houses open front and keep them single, that is the only way to keep poultry houses clean in this climate.

### Creosote Stain or Whitewash.

*Is creosote stain used for inside and outside of poultry buildings, and will you please publish formula for same? Is it superior to whitewash?*

Creosote stain is superior to whitewash in some ways. It kills mites and prevents them from breeding if sprayed about twice a year. Whitewash also kills mites, but after it has been on the walls a few days, it is entirely harmless to mites and other insects; the creosote stain keeps its qualities much longer. It is used both inside and outside and also on the roof. Crude oil and crude carbolic acid form the base, one quart of the crude carbolic to one five-gallon can of the crude oil. After they are mixed, stir in enough "prince metallic" to thicken to the consistency of cream, if to be put on with a brush, but if to be sprayed it must be thin enough to work in the pump. You will have to use some judgment in that. Some people prefer to spray because it is quicker, and others prefer a brush because it is more economical. Spraying uses about three times the quantity as when put on with a brush.

### Good Perches for Fowls.

*Are flat perches, four to six inches wide, as good as round perches?*

Perches four to six inches wide are not nearly so comfortable as those two inches wide. The very best perch is Oregon pine 2x2 and the edges trimmed, making it nearly round. A hen can then grasp the perch because its feet naturally form a curve when she goes to roost. A perch so wide as six inches might be a place to sit on, but a hen would never feel quite safe because she could not grasp it to hold herself.

### Skim Milk for Fowls.

*What is the value of skim milk as a poultry feed and best method of feeding?*

After providing for average non-assimilation and deducting the amount necessary for the maintenance of the hen, one hundred pounds of skim milk has an egg producing value of 55 whites and 18.5 yolks when fed in a properly balanced ration; these values total 73.5 egg maker units. Good meat scrap supplies 1010.5 units and dried ground green bone 536 units, therefore a good commercial meat scrap, that does not carry an excessive amount of bone, is worth about fourteen times as much in feed value as skim milk; on the basis of $3.50 as the price of the meat, the skim milk would be worth 25 cents per hundred pounds. It may be placed before the fowls so they can drink it, but best results usually follow feeding in a mixture of other food stuff; unless quite sweet it is well to make it into cottage cheese and dispose of the whey as waste. Several who have added the whey to the feed report bad results.

### Comb-Crusts From Over-Feeding.

*I have two yards of hens. One has the run of a eucalyptus grove, the other has a peach orchard; both have alfalfa. They are fed egg food, rolled barley, and gyp corn, have sprouted grain in cultivated ground; have been feeding horse meat or mixing mash with the juice; have also fed a good many gophers chopped up raw. Yard one is all right; yard two has a disease of the comb and wattles, which first appears like blisters and a dry crust forms. They do not appear to be very sick; none have died; why should the clean yard with all clean, healthy birds have it and none of the other yards?*

Your birds have too rich a diet; the comb is not diseased, but is just an outlet. The reason it appears to affect this yard and not the others is that they are strong enough to throw the refuse off through the comb and skin. The others are keeping it inside, and if you do not stop some of the meat and raw gophers you will have liver trouble with the other yards, while this yard will be exempt. In the first place, the egg food is rich enough of itself; then you add probably an equal quantity of nitrogenous food, and the fowls cannot use so much. Give the hens a good cathartic, such as epsom salts.

### Possible Ill in Rolled Barley.

*I am losing hens which look well and are sick only a few hours. When they die they are wet around the vent. I feed mostly rolled barley.*

It may be that the rolled barley has set up an irritation in the crop or intestines, which runs a quick course. Rolled barley should be soaked a few hours to take the sting out of the beards. Complaints are always numerous when a good deal of dry rolled barley is fed and there have been many losses.

### Bran and Cottonseed Meal.

*In what way is bran good for chickens? Is cottonseed meal good for them?*

Bran is good for chickens because it is rich in protein and mineral. Young chicks fed partly on bran rarely have leg weakness or any such trouble. Feeding bran to hens helps make shell besides playing a great part in the egg proper. The value of cottonseed meal for poultry is doubtful. It is very hard to digest and requires more energy than heavy laying hens can spare. Flaxseed meal is better than cottonseed meal. Another thing against it is that it is constipating.

### Formula for Home-Made Mash.

*Please give a formula for a home-made mash.*

For a small flock mix the following: Bran, 50 pounds; shorts, 25 pounds; cornmeal, 20 pounds; rolled barley, 10 pounds; beef scrap, 10 pounds; charcoal, 2 pounds; salt, half pound; alfalfa, 25 pounds. Mix all together as well as possible and feed either dry or moist.

### Home-Mixed Chick Feed.

*Please give us a balanced ration for chicks two months old and up.*

One gallon of cracked wheat; one gallon cracked or whole Gyp corn; half pint millet seed; half pint hemp seed; one quart of oat groats or pearl barley, and two pounds beef scrap. This makes a little finer feed than the average; the millet can be left out for chicks two months old and if small wheat can be obtained it would do as well as cracked wheat. Of course the chicks should have some mash besides. For this, good heavy bran and ground oats and Gyp corn with a little bone meal and beef scrap added will make a good growing ration. Bone should be about five pounds to the hundred and beef scrap about ten pounds to the hundred of other feed.

### Molting After Shutting Up.

*My hens had run of large alfalfa field, but are now confined to large, well-shaded yards, and in spite of increased feed the egg yield has dropped and the hens are beginning to molt. Am told that shutting hens up at this time of year is unnatural, and that hens will molt again this fall.*

The shutting up at any time of year is unnatural, and there is no difference in time. The molt is most likely the result of a combination of causes, one of them being the change from bugs to bloodmeal. The hens will molt again, but not likely in the fall; it will be most likely to occur about late December or January and if they molt thoroughly now the other will only be a partial molt. The best thing you can do is to feed them well. Give plenty of green feed and get them through the molt as quickly as possible. Then you will have eggs just about the time they are worth collecting and keep them at it as long as possible.

### Oily Food Causes Late Molting.

*Why are my chickens molting in the winter? They commenced early in the fall and looked fine as though they were over it, but have not laid as well as they should.*

They have continued molting or have completed one molt and gone into the second, because of too much oily or fatty food. Soybean meal, linseed oil cake, cocoa cake meal, whole or ground flaxseed in oversupply will cause this trouble. It is possible to cause them to lose their feathers and rebuild new ones continuously through the whole year if enough vegetable oil is supplied. Animal fat acts in the same way, but in smaller degree.

### Sunflowers for Eggs.

*What is the value of sunflower seeds as food for chickens, in special regard to eggs. Can they be fed whole or must they be crushed?*

Sunflower seeds are a valuable addition to a ration, but as they contain a great deal of fibre, they have a low digestibility. They are much too concentrated to be fed as a daily ration. Their chief use is in the molt; and then should be fed very sparingly. Fowls will eat them whole just as well as crushed, but they are too rich to feed heavily.

### Feeding Broilers for Market.

*Will you give me a good formula to feed broilers for market?*

If you can get sour milk or buttermilk, mix all your mash feed with it, as the broilers will fatten quicker and be a much better color. If you have cheap potatoes, cook them, then mash, adding corn meal or ground oats and shorts with a little salt. Potatoes make a cheap fattening diet but need thorough cooking. Mix one part ground oats with one part fine shorts or low grade flour and one part bran. Mix the whole with sour milk or buttermilk and feed what they will eat up while fresh. In feeding all milk mixtures this rule must be followed, because if the food lies around and gets sour, the chickens will not eat it or if they do it will cause bowel trouble. The second week leave out the bran and feed just ground wheat or oats and flour, the third week add a tablespoonful of tallow to the mash for every bird fed, this is as long as they can be crowded with this fattening diet so don't commence feeding this until your broilers have reached the required size.

### Dried Milk-Curd for Poultry.

*I have more skim-milk than I can use to advantage. I am curdling it, then draw off the whey and dry the curd in the sun. Will the curd make good chicken feed, and what is its feeding value compared with good beef scraps or fish meal? Is there any feeding value to speak of in the whey drawn off?*

Well cured meat scraps and fish meal are dried down until they contain only about ten per cent of water. Seventy-five pounds of milk dried down to the consistency of beef scrap, containing ten per cent of water, would weigh about eight pounds. Its feeding value would be just about the same as eight pounds of beef scrap, varying somewhat one way or the other, according to the other foodstuffs fed in connection with it. To illustrate: The 75 pounds of milk dried down to eight pounds, containing ten per cent water, would be worth, at 3½ cents per pound, 28 cents, while eight pounds of beef scraps at 3½ cents per pound, would be worth 26 cents. Fish meal at three and one-fifth cents would be worth only a trifle less. Draining the whey and drying the curd in the sun is all right, but it is believed that it is dangerous to feed the whey to poultry.

### Green Winter Feed.

*What is there in the line of greens suitable for poultry that can be grown without irrigation?*

Rape planted in fall or winter will send roots down and keep green sometime into the next summer. The soil must be moist and fine when it is broadcasted, to give the seed a chance to germinate. Giant kale planted in the fall in moist soil will persist till spring when alfalfa or green corn is large enough to feed as fodder. Fall sown rye or other grain will give green winter feeding.

### Soft Shells and Egg-Bound Hens.

*What are the causes of soft shelled eggs and egg-bound hens and what are remedies?*

The cause of egg-bound cases is internal fat. Soft shell eggs are nearly always caused by the same conditions, but not quite all. Sometimes a fright will cause hens to drop soft eggs, or a lack of lime in the system. In that case the remedy is to supply more lime in the way of old plaster, oyster shell, or bone. When the trouble is caused by too fatty condition, the remedy is to lessen their feed. Get some straw or other litter and feed all grain in the litter, make the hens exercise more for it, also feed less mash.

### Feeding Little Chicks.

*In raising chicks from an incubator I have been feeding chick feed and boiled eggs. They are two weeks old and seem strong, but for the past few days they have been dying. They become droopy and die very quickly.*

First cut out the eggs. It is strange that people will stuff little chicks with such concentrated food and expect them to live. Chop up a head of lettuce and an onion or two, just as fine as you can, so they will eat it, and mix with a little bran and rolled oats. Feed them this two or three times a day and the chick food the balance. Your

chicks are dying for lack of something to eat. Eggs are not natural food for little chicks and while they can be fed to good advantage, mixed with other things, too much egg constipates the little fellows and does more harm than good. Give chicks grit, ground oyster shell and charcoal and get them interested in green feed, then they will soon quit dying.

### Crippled Chickens.

*Why should chicks hatched in incubator be crippled in the knee joint, often the bone is sticking through the flesh, while the ones hatched under hens seldom are?*

The most common cause of the crippled condition of newly hatched chicks is overheating of the incubator during the hatching period. If this crippled condition develops in the brooder shortly after hatching, instead of in the incubator, it is due to overheated condition of the brooder floor. If the chicks are two or three weeks old before the trouble occurs it is due to lack of bone-making material in the food.

### Raising Ninety Per Cent of Chicks.

*How can I raise ninety to ninety-five per cent of the chicks I hatch?*

How to raise ninety to ninety-five per cent of chicks is not answerable unless a person knew the stock the chicks came from and the man behind them. The most vital things in chick raising are first to see that they are not fed too soon after hatching, then fed right at regular times; kept free from colds, clean and comfortable, and have green food. I have raised 100 per cent of chicks by hand, but could never trust hens to do quite so well.

### Breaking Hens of Egg-Eating

*Why do hens eat eggs, and what is the cure for it?*

Hens eat eggs because they get the taste by eating fresh egg shells thrown to them or by accidentally breaking eggs in the nest. Once we effectually broke our hens from this practice. A hole was broken in one end of each of a few eggs and plenty of red cayenne pepper was inserted. These pepper eggs were laid in the nests of the egg-eating hens and it was not long afterward that we saw certain hens going about the yard with mouths wide open trying to cool off.

### Bad Odor and Taste of Eggs.

*Why do some of our eggs smell and taste bad. Is it a fault of any breed?*

The fault probably lies either in the feed or in the individual hen. Sometimes, a hen is found that retains an egg so long before laying that decomposition sets in. If you happened to breed from that particular hen, you would of course get more than one in your flock

and this is the most likely supposition. Look well to your feed and if you are not feeding anything that is likely to cause the trouble get a trap-nest or two and find the culprits. Some beef scrap and fish meal give bad flavors, so if you are feeding that, change the brand and see if it makes a difference.

### Watery and Running Eggs.

*Why do my hens lay watery eggs? When I put the eggs in the frying pan they spread all over the pan instead of standing up. The first I noticed was last fall; they got all right during the winter, but now are watery again. When they are boiled hard the yolk has a green tinge all around the outside where it fits into the white.*

The indications are that they have too much sloppy feed and not enough good dry grain. Nothing makes firmer eggs than a good hard grain diet. If the green feed is of a very watery nature and not enough grain to offset it, the eggs will be watery. Again, if the nests are in a warm, moist place, that might have a tendency to make the eggs run; somewhat like eggs that have been a few days in the incubator. It is impossible to be too careful in handling eggs, or in feeding for them; for the food a hen eats makes all the difference in the quality of the eggs produced. Give the hens a tonic and feed them more grain until they get over this failing. The following tonic has given very good satisfaction. It need not be continued for more than two or three weeks. Probably you will notice a difference in just one week: Tincture of red cinchona, one fluid ounce; tincture of chloride of iron, one fluid drachm; tincture of nux vomica, four fluid drachms; glycerine and water to make four ounces. Give one teaspoonful in one quart of water, allowing no other drink. This tonic can also be used for indigestion, but hens do not like it; so care must be taken to keep other water away or they will not drink that containing the tonic.

### Mottled Shelled Eggs.

*Why do my hens lay a mottled shelled egg and what is a remedy?*

This is a characteristic of some breeds, but is sometimes caused by either scattering scratch feeds in straw or by making them hustle should be increased and the carbohydrates decreased and the hens should be made to exercise more. This latter may be accomplished by either scattering scratch feeds in straw or by making them hustle harder for their feed in open fields.

### Wry Tail.

*I have a hen with a wry tail, and as she is all I got from a setting of costly eggs I sent east for, hate to lose her. Do you think she would breed that kind of chicks?*

It is too bad a defect to take any risk with. Better lose her than raise a lot affected with the same defect. Sometimes wry tails are

caused by cramped quarters or rubbing against something continually. If it is from these causes then it would not be so much of a risk, but if it is a natural wry tail certainly do not breed from her.

### For Sitting Hens Which Are Quitters.

*Several days after setting my hens they leave their nests, their combs turn black, and they have a greenish dysentery; are healthy before I set them; they have a separate pen or house; are fed wheat; have clean water, dust bath, and plenty of ventilation in the house. Have lost about five hens and their settings of eggs in the last week.*

Have you examined the nests for mites? Do this at once, for they drive hundreds of hens off their nests by sucking their blood; then of course the comb turns dark and finally black and the hen dies. Open up the feathers and see if you can find them; also see if the eggs are specked as if flies had been on them; if so, you have found the cause. The remedy is to disinfect the house at once. Put some tobacco stems in the nests and clean off the hens with a dip made of creolin and water just warm. If there are no mites, your hens have indigestion. In this case, parch in the oven all the wheat you feed to them. Do not burn, but just bake slowly until it smells so nice you want to eat it yourself. Give them all of this parched wheat and rolled oats they will eat, and put half a teaspoonful of tincture of nux vomica in a quart of water; divide that among all your setting hens. Some hens are so feverish over setting that they neglect to get off the nest to eat and drink until the digestion is impaired; then it is too late unless the hen has very good vitality. Go around early in the morning and lift off all setting hens that have not been off. In this way get them started right and then they get off regularly. Hens have no judgment—at least they don't use it when broody, so we have to show them what is best.

### How to Distinguish a Guinea Cock.

*How can we tell the male from the female guinea fowl, at any age—say one year old. They look so much alike; nobody seems to be able to tell which is which.*

C. S. Valentine, author of "The Beginner in Poultry," says: "Males are distinguished from females chiefly by their cry. The males are slightly larger than the females; the voice is more strident, and where the young are being fed, the male's careful auxiliary protection of the female and her little ones distinguishes him. One may make unnumbered efforts to head off the male from his family, but he always will appear between his charges and the threatening peril, to insure protection."

### The Chances With Duck Eggs.

*Is it true that duck eggs bring a better price than hen eggs?*

The truth of the statement is doubtful; unless you make a market you will not get as much for them. Bakers and confectioners like

duck eggs to use in their business, but when we consider that bakers and restaurants are in the habit of using cold storage eggs and Chinese eggs, it does not look very promising for a bigger price for duck eggs from that source. The profit from ducks is made, not from the eggs, but from the green ducks sold for table purposes, or in keeping stock breeders and selling eggs for hatching. In a rainy locality, during the winter and early spring months you would have to keep a good bed of straw for nests or the eggs would get almost too dirty for sale as food. Duck eggs, like hen eggs, absorb any bad odor that may be near them, and a duck is not cleanly in its habits unless you force it to be so.

### Laying Feed for Ducks.

*What is the proper feed for ducks to make them lay; also what quantity for fourteen ducks? Have been feeding barley and bran, and barley alone. They have a free range of grass and running water.*

The proper feed for ducks is a balanced mash and a little hard grain at night. They will not do their best unless they have it. Barley alone is a very poor ration; barley and bran is but little better. The mash should include the following ingredients and what you do not have or cannot get handy of course you will have to do without or substitute something else. Bran, two parts; middlings, one part; coarse ground corn-meal, one part; beef scrap, two parts; bone meal, half a part; ground barley, two parts. Mix this all together by measure and you have a mash that can't be beaten for laying ducks. A little corn, wheat or oats, or even barley, for the night meal will last them longer. Ducks that have range will regulate their grit and water themselves, but they will lay more eggs if some form of shell material is kept handy. Do not feed a bit more than they will clean up at one time. When you have gauged the quantity once, you will know how much to mix for the next time. It is a mistake to try to stint ducks to just so much; they want "heap bellyful," and if you don't give it to them they won't give you the eggs.

### Ducks Died After Pipping.

*My duck eggs pipped on the twenty-fourth day and died in the shell. After the eggs began to pip, how long before they should be out?*

The heat has been too high. The ducklings should not have pipped until the 26th day at least and the 27th would have been better. Run the incubator at 101 the first week, 102 the second and third, and gradually bring it up to 103. If it runs up to 104 during the third, and it will not hurt, but do not allow this during the first week of incubation. After they pip, if the heat has been right, all should be out in twelve hours, but sometimes ducklings have to be helped out, if the shell has not been rotted with moisture.

### Milk for Ducks.

*Can I raise ducks on sour milk and have them do as well as if fed beefscraps?*

It will depend on how the milk affects the bowels. If the ducks do not scour, milk will do as well as beefscrap and make more bone. The chemical difference between sour milk and buttermilk is little. Watch your ducks to see if the milk affects their bowels too much, and if it does, keep away a few days or add more middlings and less bran; one of these things is just about as high in price as the other, so it is just as cheap to feed middlings as bran.

### The Quack-less Duck.

*I have heard of a duck which does not quack. What is it?*

The exhibit of Muscovy or quack-less ducks at the Exposition poultry show attracted much attention. In villages and towns, where the noise of other ducks would be annoying to the neighborhood, the Muscovy is the one.

### Fall Ducks and Geese.

*Is it possible to purchase day-old ducks or geese in the early fall and can they be successfully raised at that season?*

It is possible to produce duck and goose eggs that are fit for hatching in the early fall, but only a very few breeders understand how to do so; besides, at that season of the year the demand for day-old ducklings and goslings is so limited it is practically impossible to find any one prepared to supply them. If hatched from good fertile eggs ducks and geese may be raised in California at any season of the year, but abundant shade is absolutely necessary in hot weather.

### Goslings Need Digestible Feed.

*What is the proper feed and care for goslings?*

The feed for goslings for ten days or two weeks should be something easy to digest and not very much of it at one time. Bread soaked in milk, and the extra milk squeezed out, a little rolled oats, chopped lettuce, and a little milk curd are all good, not forgetting to add a little coarse sand to the feed, or in the absence of sand a little fine chick grit. Give warm water with the chill taken off, to drink at the same time food is served. They need none at any other time, unless weather is hot. Keep moderately warm at night, but a dry bed of straw is really the best, with a cover of some kind; and last, but not least, provide shade for the day time. A dry bed and shade are the most important things to remember in the care of goslings, for one hour in a hot sun will cause nice little goslings to fade away before your eyes.

### Selling Goose Feathers.

*I have some A1 goose feathers which I should like to sell, but can find no market for them.*

The Sunset Feather Co. and the Crescent Feather Co., of this city, buy feathers. The former company pays 27 cents per pound for goose

feathers which must, at that price, be white, clean, dry, and unmixed with hen feathers, which sell at 4 cents but are worth a good bit less than nothing when mixed with goose feathers. If you have a large quantity, you will save freight by compressing them.

### Ganders or Geese?

*How can I distinguish the sex of Toulouse geese?*

It is very difficult. Put a suspected gander on one side of a tight board fence and the geese on the other. The gander's voice as he talks to the geese is a louder, coarser, honkier sound, while the geese are more musically voiced. Observing their copulation is a sure way to distinguish —if the gander doesn't get mixed with the geese before you catch him.

### Proper Coloring of Toulouse Geese.

*Which is the Toulouse goose, the big grey one with the black tip on the bill, or the one with the orange blossom tip?*

The bill of the pure-bred Toulouse goose should be orange yellow to meet the requirements of the poultry judge. Black spots on the bill are usually caused by bruises, when young, but so long as the birds come up to the standard in other ways, the black spots should not be any detriment in the breeding of pure-bred young stock.

### Need Tom for Each Clutch of Eggs.

*After all my turkey hens had gone to setting on their first clutch of eggs my Tom died. Will the second clutch be fertile.*

It is generally supposed that a turkey hen needs the attention of the male once for the season; certainly once will fertilize one clutch of eggs, but when the hens sit a month on the nest, then perhaps some time with the poults, it is almost like a new season and it is better not to risk it because in the end the gobbler would cost no more than the loss of the eggs in case they should prove infertile.

### Maturity in Turkeys.

*Are the first eggs of turkey hens any good for setting? How old are the turkeys before they start to lay?*

Turkey hens should be over a year old before their eggs are used for setting. Having complied with this, the first eggs are all right and they usually come in time to hatch for the Thanksgiving market.

### Exposure and Turkeys.

*My little turkeys get weak in the back and legs; sit on their knees with their feet off the ground. It comes on very quickly. They have a good appetite but always die.*

Wet, damp ground probably brings on cramps and general debility. Unless you can shelter them until the weather clears, there is little else to be done.

### Treatment for Turkey Diseases.

*How can I check turkey cholera?*

The most distinguishing symptom is a pale, bloodless comb. No satisfactory remedy has been discovered, but the following has sometimes produced favorable results: One dram—one-eighth of a fluid ounce—of carbolic acid diluted in one quart of water; one dessert spoonful of this to be given to each adult turkey—only one dose. The spread of the disease may be checked by removing the sick birds and thoroughly disinfecting the premises occupied by the flock.

Black head is often mistaken for cholera, but it is easily distinguished because in black head the comb and entire head turns black. It is a germ disease of the liver. It is often more difficult to cure than cholera. A remedy that sometimes proves beneficial is as follows: For each ten-pound weight of fowl give, two or three times daily, twenty grains sulphur, two grains sulphate of iron, two grains quinine. As in cholera, the chief thing is to promptly remove the sick fowls and clean up and thoroughly disinfect the quarters.

It is possible that your turkeys have intestinal catarrh. The most prominent symptoms are loss of appetite, roughness of plumage and indisposition to move. The comb and head are not discolored to such a degree as in cholera or black head. The fowls are more or less troubled with dysentery according to the nature of the feed they have been eating. Remove the sick birds to comfortable quarters and feed small quantities of mashed or cooked food with a little meat scrap. Put a handful of oatmeal in the drinking water or give milk for drink. Give one tablespoonful of olive oil, after which give three times daily, in water or in capsule form, washed down with water, one grain bicarbonate of soda, two grains sub-nitrate of bismuth. If the dysentery continues after the fever has disappeared give on dram of sulphate of iron in one pint of drinking water. A dram is one-sixteenth part of an ounce avoirdupois.

### Too Much Sour Food for Turkeys.

*My turkeys are six months old and have done finely. Now two of them refuse to eat and droppings were a deep yellow in color; they will not eat but drink considerable. We feed corn morning and night, and they run on grapes and tomatoes all they want and drink sour milk.*

Your turkeys have been having too much acid; sour milk, grapes and tomatoes are pretty sour stuff and the mixture has caused indigestion. Not being noticed until they stopped eating, this developed into inflammation. Shut them off from the grapes and tomatoes, and for a few days give ten drops of tincture of nux vomica in each quart of water excluding the milk, merely to get them to drink the medicine, then return to the milk but not to the other acid products.

### Too Much Bulky Food for Turkeys.

*My turkeys have crops full of food that does not pass out and is very sour. They stand with their wings drooped and refuse to eat, and in about twelve days they die.*

Change your feed, for the supposition is that the feed has been too bulky and the turks have lacked exercise. Unless you empty the crop, very little can be done. When you find one with its wings drooped, catch it, then get about a pint of warm water and pour a little at a time down the gullet. Work the water among the food in the crop with your hand, doing it gently so as not to hurt; then hold the bird head down and make it vomit the feed and water. Keep this up until you have the crop empty, then wash it out with baking soda and water, holding the bird so that this water also runs out of the mouth. After the crop is clean, give the bird a tablet of nux vomica and sulphur compound, 1-100 of a grain strength each, morning and night until it digests its feed properly.

### Look for Mites in the Morning.

*I had one hundred and twenty little turkeys hatch during the last month and now have only twenty left. They have no lice or diarrhoea. When I go out once they are all right and eating; next time I go out to look at them in perhaps ten minutes I find two or three dying.*

It is probably either lice or mites that is doing the mischief. Look well into the brooding place very early in the morning and I think you will find some nice little red fellows that have dined off your turks while you slept. To anyone not accustomed to the ways of mites it is not easy to find them until they have taken full possession of a place; hence the need of looking early in the morning. At that time they are full and, of course, lazy. You will find them under boards, in cracks, and about all joints and knots in lumber where chicks and turks are. There is nothing else that could clean up a lot of turks like that and leave no trace of its work. Diarrhoea gives itself away, but not mites or lice; of course you can find the lice, but mites are mighty cunning.

### Feed for Young Turks.

*I am feeding my young turks hard boiled eggs, onion tops, and curd. As I have more hatching soon, would like to know what to do for them.*

Your feed is about all right. A little corn meal mixed with the egg and a little rolled oats would be a good addition. Turks must have something in the cereal line such as bread crumbs, corn meal, and rolled oats. These are all easy to digest, yet nourishing.

### Yellow Droppings From Young Turks.

*What shall I do for yellow droppings from young turks, and how shall I feed them?*

What not to feed little turks until at least two weeks old is: All or any kind of grain; they cannot digest it. Very likely you have done so and your poults are suffering from indigestion. If so you will find a few drops tincture of nux vomica in the drinking water one of the best tonics for the indigestion. Say ten drops to a good quart of water the first two days, then reduce it to five drops. Give until turks show good, healthy droppings. If you have fed right, with soft feed as stated above, then give Carter's little liver pills, one to a bird at night, but for indigestion caused by incorrect feeding I prefer the nux vomica. The only way to cure a turkey poult and have it back in the flock well in a few hours, is to catch it in the first stages before the trouble materializes into a serious case. This means to watch the droppings every morning and catch the sick poult.

### Pendulous Crop in Turkeys.

*What can you tell about the cause and cure for hanging crop in turkeys, which is a very distressing affair to look at, at least?*

The name for the trouble is "pendulous crop." It is more or less prevalent all through the San Joaquin valley, possibly beyond, and has received some attention from poultry experts. It is not a disease, but is a mechanical affair which may not interfere with the health of the bird until it becomes mechanically impossible for the crop to discharge its proper function. It is believed to be caused by repeated distension of the crop owing to previous overfeeding, or to distension by the gas resulting from slow and defective digestion produced by overfeeding. The condition requires no treatment for fowls intended for the market, as it will not interfere with their health for a moderate period of time. Birds which are of extra value for breeding purposes or otherwise can be treated in this way. First—Preventive treatment: feeding of foods easily digested and in moderate quantities. Second—Local treatment: bathe in cold water in which one tablespoonful of vinegar and one teaspoonful of salt has been added to each pint. In extreme cases a bandage strong enough to lift the wall of the crop, but not sufficiently tight to interfere with the necessary movements of the muscular coat. The trouble may be due to bringing a wild bird so quickly to a course of high living. If the turkey has to fly a few miles to a damp spot for feeding, he probably does not gorge himself so frequently as he might when surrounded by broad acres of alfalfa.

### Round Poultry Worms.

*Give me remedy for worms in my young pullets. Also what is the cause?*

Premises once infested with the common round worm of chickens are almost impossible to clean up, due to the fact that the eggs have been scattered almost everywhere and to the fact that these eggs retain their vitality for a long, indefinite period. The common worm mentioned is the Ascaris Inflexa, which can be killed and expelled from the intestine with five 10-grain doses of Areca nut mixed in the

food. However, the birds will immediately reinfect themselves if the yards and houses are not cleaned up and disinfected at the same time. To kill the eggs in the manure it should be treated with unslaked lime. The drinking fountains must be so built that the birds cannot contaminate the water with their feet. One of the best methods is to move the birds after they have received the Areca nut to fresh soil and to crop the old yards for one year to insure the destruction of the eggs.

### Wood Ashes for Worms.

*How much wood ashes would you give to a hundred hens in the mash for worms?*

A good-sized fire-shovel full of sifted ashes, and if the wood is oak, so much the better. Oak is the best wood for that purpose; some wood ashes have very little value.

### Chicken Tape Worms.

*I find a flat white worm nearly two inches long in the droppings of my six months chickens.*

It is a tapeworm and does not hurt the chickens except by stealing their food. Feed the chickens all the chopped garlic and pumpkin seeds they will eat after letting them fast twenty-four hours. Chopped garlic bulbs clean intestinal worms out quickly except in serious cases, when a vermifuge is necessary. Garlic tops are not so dependable because not so strong, but usually clean out incipient infections if fed once in two weeks or a month. Garlic taints the eggs of some hens more than others and should be fed only for worms. Chopped or ground pumpkin seed are best for tape worms in laying hens.

### Moth Balls Only a Help.

*Is it true that if I bore holes every eight inches in my chicken roosts and insert moth balls, that the chickens will be kept entirely free of vermin?*

This plan will help to prevent the fowls and houses from becoming infested with vermin or to reduce the number, but it will not prove to be a cure-all for this trouble. The moth balls will produce no bad effect on the fowls. In addition to the proposed plan the roosts should be painted with some commercial lice paint or with stove distillate to which has been added about ten per cent of crude carbolic acid or other germicide. Still greater benefit can be obtained by spraying the entire interior of the poultry house.

### Ointment for Lice.

*Give an ointment for lice and how to use it?*

The ointment or salve recommended is mercurial ointment, U. S. strength. Mix the ointment with equal weight good tallow or lard and rub a piece the size of a pea below the vent; rub well into the skin,

not merely on the feathers. This ointment will drive lice away and kill them, but it is not good to use on stock that are being used for breeders as it may cause infertile eggs. On all other stock it is all right.

### Fits Due to Lice.

*I have a hen that acts as though she had fits. She tumbles around four or five times and draws her toes together as if in pain. She can not pick her corn off the ground but if I put it in a box she will eat it.*

Give the sick hen a little warm mash in which you mix a tablespoonful of Epsom salts. Use lice powder on her, and find out if she has head lice. Probably lice and worms cause the hen's condition. Louse powder may be bought at any poultry feed store in one-pound cans and if you have but a few chickens, that will be the best way to purchase, as it soon loses its strength. To apply, turn the hen on her back and hold the legs apart, dust well along the abdomen and under the wings; then turn the hen on her breast and dust tail and back well up in the head, neck and all around. Make a good job of it, and put the hen in a coop for a short time so she won't shake all the powder out of her feathers.

### Scant Feathering.

*I have chickens a few weeks old with very few feathers. What is the cause of it? My neighbors say it is feather lice.*

It is natural for the larger breeds of fowls to be more or less scantily feathered at certain periods of chickhood, but the lack of feathers might be, to a certain extent, due to feather lice. If these are present they may be readily detected by examining the chicks. They are usually found on the larger feathers of the wings and tail. Any good insect powder or very fine flowers of sulphur rubbed into the plumage will destroy them.

### Cleaning Out Poultry Ticks.

*How can I get rid of poultry ticks?*

To clean the houses and ground of ticks requires a good strong disinfectant and the will to use it. Kreso Dip No. 1, used strong will do the work. Or take one quart of crude carbolic acid to three gallons of crude oil, and spray every crack and crevice of the buildings, under the sills and in the ground around them, if you have to turn the buildings over to do it. Then dip the hens in a solution of Kreso Dip No. 1 and warm water, or take Creolin and use a tablespoonful to the gallon and dip the hens over head, see that the feathers are well soaked, then set them out in the sun to dry. Grease the ends of the perches and underneath with tallow and beeswax to prevent the ticks from crawling onto the hens again if any survive. A soft grafting wax with plenty of tallow is fine, but it must be soft or they can crawl over it.

### Trapping Seed Ticks.

*My chickens have those black chicken ticks that bury their heads into the flesh.*

This tick is one of the most difficult pests to destroy, and will live through conditions that would be fatal to almost any other species of insect. Spray the house both inside and outside, repeating six to ten times with an interval of three days between each spraying. The following sprays may be used: Whitewash containing carbolic acid; distillate mixed with carbolic acid or creosote; crude petroleum; boiling water, strong kerosene emulsion, etc. Before spraying the house, the fowls should be moved and placed in boxes or coops where the seed ticks can drop off as they become gorged, which occurs in about eight or ten days. Coops arranged with a wire net bottom through which the ticks can fall into a pan containing kerosene or strong spray material would trap most of them as they drop from the fowls. After two weeks in these temporary quarters, it is usually safe to return the fowls to their original quarters.

### Common Fleas on Chickens.

*How can one fight the little fleas that live on chickens' heads and throats? Our chickens range and do splendidly with the exception of those hatched in the late summer or fall. These become infested with fleas that live on chickens' heads and the use of antiseptic salve on their heads has to be repeated every few days and that is hard on the baby chick as well as a great deal of work. There are none of the fleas in the chicken house.*

The samples you sent seem to be just ordinary fleas and not what is usually known as chicken fleas. The only way to prevent them from attacking the chickens and to gain permanent relief is to first destroy their breeding places and then treat the chickens with insect powder or the ointment you mentioned. These hopping fleas prefer to breed in dusty cracks and corners of buildings, but when forced to do so they will breed in the open in the dust or sand. For the houses, clean out dust as much as possible and spray with distillate and carbolic acid or naphthalene flakes dissolved in cheap kerosene. For the yards, spray with water and hoe or thoroughly stir the dust or sand while spraying. We have never found anything that was superior to water and hoeing for killing them in the open.

### Nightshade Poisoning.

*My fowls seem unable to pick up their food, stand about with a peculiar look in their eyes, and at times attempt to run backward. I had them in small runs provided with litter for scratching and in addition to the grain and mash, fed them until lately with garden greens. When the green stuff ran low, I turned them out to hunt what greens they could find in a small creek bed that is near the poultry yards.*

Your fowls have been eating the deadly night-shade—Atropia Belladonna—a small plant with reddish, bell-shaped flowers, and shining black berries; it grows in just such places as you describe. The flowers somewhat resemble the bloom of potato plants.

The trouble may be avoided by either searching out and destroying the plants or by serving the fowls a proper supply of wholesome green stuff. The fowls eat the poisonous plant only when other greens are scarce. In the vicinity of San Francisco, Oakland, and the adjacent foothills, the poultry keepers have frequent unpleasant experiences with this plant.

### Blindness of Sitting Hen.

*One of our hens set for about two weeks and then went blind. She is free from lice and was setting in a cool place free from draughts. Her eyes are as clear as ever.*

Your hen's blindness is due to nervous trouble which is sometimes caused by change in blood pressure from long changes in attitude. Give her nourishing food and wash the eyes and head daily with a saturated boric acid solution. As to whether she recovers will depend on how badly the nerves have been damaged and this will take time.

### Fowls Die of Catarrh.

*My half-grown chickens have a watery discharge at the mouth and one or both eyes seem closed; the chicken gets very thin, and dies in about ten days. Is it called roup, and what is the cause of my trouble? How can I cure them?*

The symptoms indicate that these fowls are suffering from catarrh which is caused by dampness, draughts caused by cracks in roosting house, unventilated houses causing sweating at night and chill through exposure to cold, rain, or fog when leaving house in the morning, or vermin. Fowls that have been underfed or supplied with a too starchy ration are most liable to contract this ailment. It so nearly resembles roup that it is usually mistaken for that disease. For treatment, bathe or dip the head of the fowls twice daily in a solution of one-half ounce boric acid in a pint of tepid water; and give coarse, moist mash seasoned with ground ginger. A rich sticky mash should be avoided. A disinfection of the house will also help greatly even though it may be clean and free from vermin.

### Swell-Head Which Is Not Roup.

*Is "swell-head" always roup?*

There are cases of swell-head which are not roup. "Swell-head" proper is easily told from roup. The head gets very hot, the eyes swell and close and the whole head feels soft and hot. This is sometimes from the bird being exposed to a draft of air and other causes. A dose of cooling medicine such as epsom salts or sulphur and a little

bryonia and aconite in the water will take it away without any bad results. But if it is neglected it will develop into roup.

### Roup and Canker.

*My chickens' eyes get sore and close; some have canker in the mouth and will not eat.*

Your chickens have roup. Canker in the mouth is caused from many things, and is often quite distinct from roup. Fussing with mild remedies is little good. Take a hairpin, open the mouth and draw through the place, bringing all the cheesy matter with the hairpin if possible. Get all of it, even if it makes the mouth bleed, then wash or swab the place with any disinfectant and put all the dry powdered bluestone on that it will hold. Keep the bird in your arms awhile until it has been absorbed, then set it away in a dry, cool pen. You may have to repeat, but it usually effects a cure at two dressings—that is, if it is canker without roup. But when it is accompanied with a roupy smell, it is hardly safe to bother with it, for very few birds amount to much after being so badly affected. (See Part VIII, Vol. I.)

### Roup or Chicken Pox.

*A swelling appeared under the eyes and above the nose of a gobbler similar to a water blister on a person. This was on a six-months gobbler; now a hen is affected. It does not look like roup to me. The eyes are not closed.*

If there is no roup smell, it is chicken pox. If you have had experience with roup, test the trouble by the smell. Feed a little sulphate of iron in the mash in either case and if it is roup, dip the head in a ten per cent solution of creolin and warm water. Do this several times if necessary. If it is chicken pox the lumps will be hard; dip in stronger solution and rub carbolized vaseline over the head. Clean up and scald all drinking vessels and feed troughs and you will stamp it out.

### Chicks Droopy With Crop Catarrh.

*My chicks stand around and droop as they do with white diarrhoea, except they do not show any other evidence of it but to drop their wings. Their crops are large and soft, and when I press on the crop a slimy, clear fluid runs from the crop.*

Catarrh or inflammation of the crop—cause, indigestion from overfeeding, irritating or moldy food, foul seeds, etc. Treatment—In serious cases, empty the crop by holding fowl head down and very gently working out the sour liquid. When crop is empty, give epsom salts or a mixture about six grains subnitrate of bismuth and three grains bicarbonate of soda in a small amount of drinking water for each dozen chicks. Take away all food for about eighteen hours and then feed little and often.

### Limber-Neck.

*I find a big hen sitting on the roost with her head hanging down. No matter where you put her, she would stay that way, and refused to eat or drink.*

The trouble is limber-neck; is the result of the hen eating some poisonous meat or refuse of some sort. Some old rotten carcass, even that of a mouse, or of dead poultry, will cause this. Once a hen is attacked it depends upon whether she is strong enough to throw it off, or is given aid promptly. A good, big dose of olive oil is the very best remedy. Put the hen in a shady place, and leave her until the oil has a chance to carry off the poison or neutralize it. If the hens are strong, and have not eaten much of the decayed stuff, they will, in most cases, get better without treatment. Look well over the premises and find all refuse that is likely to harbor maggots. For no matter how well fed fowls are they will eat more or less of this stuff if they find it. A hen that has had a bad attack of limber-neck is of very little further use. (See also Part VIII, Vol. I.)

### Turkey Liver Trouble.

*My turkeys, running on alfalfa, become sick for a few days with a diarrhoea, then die. I found its liver was all spotted, and almost ready to decay.*

This is a case where the first symptoms have not been noticed and it ran on, ending in death. The real cure for all liver troubles is watchfulness and prevention as far as possible. Give each bird a teaspoonful of castor oil to clear the bowels, then give two or three of Carter's liver pills for a week. The birds should also have good feed, clean, dry grain along with the alfalfa.

### Fowls "Going Light."

*Some of my fowls get very thin and light all at once and then die suddenly. We fed Kaffir corn till lately, now I give them a bran mash twice a day.*

Whenever you have a case of a hen going light all at once and dying, there should be an investigation right then. Your feed is certainly light enough to cause the hens to go light. A bran mash twice a day, or even Kaffir corn, unless the hens had a good grass range, is not sufficient for hens—there must be more of a variety. Both of these feeds are good of themselves, but it is too narrow a diet to preserve health and strength. The symptoms you give point to tuberculosis. Make a post-mortem examination of the next hen that dies and see what condition the lungs are in. It may be just plain poverty that ails your birds, and the remedy would be to clean up all dirty litter and improve the diet by adding some grain and a little beef scrap and barley meal to the bran mash. Also give them one teaspoonful, in a quart of mash moistened but not wet, of the following tonic: Iron sulphate, 1 ounce; calcium phosphate, 8 ounces; fenu-

greek, 4 ounces; black pepper, 2 ounces; table salt, 1 ounce; ground gentian root, 2 ounces. Mix all the powders together dry, and feed in mash as directed. All fowls that die of anything so suspicious as "going light" should be cremated, not buried. And all droppings should be carried far enough away from the others to insure safety and mixed with the earth. After everything is cleared up, spray the runs with sulphuric acid disinfectant and keep clean.

### Coughing Pullets.

*What shall I do for a pullet that coughs all the time but in other ways seems to be all right, eats well and has red comb?*

There may be something in the pullet's throat. I have seen ground bone stick in fowls' throats and stay there until they got so thin they could hardly walk. Better examine it; and if there is any obstruction, take it out with a small pair of pliers. If the windpipe is clear, give a mixture of eucalyptus and olive oil, a few drops several times a day, or any good cough remedy you happen to have. If the trouble was any deeper than the windpipe, the comb would not be red, neither would the pullet eat well. The comb is the health indicator; when that is all right nothing is very serious. We should look for little ailments where they are localized.

### White Comb.

*What is the cause of a cockerel's comb and face turning white?*

This is called "white comb," and is caused by a parasite something like the small parasite in scaly leg. If you notice closely you will find a fine white powdery scurf that is a diminutive scale. Bathe the face and comb with a two per cent solution of Pearson's creolin. Dry, and apply an ointment made of carbolated vaseline and one per cent iodoform. As it is infectious it is desirable to segregate the bird so affected.

### Scabby Growths on Head.

*A number of chicks one to two months old have had a growth, usually on the eye or in the corner of the mouth. Most of them seem to recover eventually, but of course it delays and stunts them. The growth seems to be like a light colored scab and can be broken off though it seems to go into the eye socket.*

The chicks are debilitated; due to the lack of stamina in the parent stock. Give them good feed and if yarded turn them out on grass. Ground oats mixed in the mash will tone them up. Add plenty of succulent green feed. Give a little nux vomica in the drinking water to aid digestion and see that the quarters are kept clean. Carbolated vaseline would be good to put on the scabs. Peroxide also is healing, anything that will heal the sores will help; but the cure rests with improving the blood by good feed.

### Rabbits' Livers Spotted.

*I have lost rabbits when about a third grown. I feed green feed entirely to them. I dissected one after dying and found white spots on the liver. Would muriatic acid in the drinking water help?*

All rabbit raisers agree in feeding dandelion for spotted liver, but this does not mean all dandelion and nothing else, but just enough to act as a tonic. Milk weed and young teazel are also relished and are splendid if not fed exclusively. If your rabbits are kept in too close confinement without proper room for exercise and without sunlight at least a part of the day, attend to that without delay, as nothing is more conducive to spotted liver. Straw, barley, and a variety of green feed (except cabbage) with plenty of room and sunlight, ought to mend matters. If you have an enclosed field where dogs cannot molest them, turn them loose awhile and note results. A little muriatic acid (one teaspoonful to the gallon of water) once in a month is a good thing, but an ounce of prevention is worth a pound of cure.—Mrs. B. H. Gilkey, Santa Rosa.

### Rabbits Die After Eating Wet Green Feed.

*Why do I lose my weanling rabbits? Every morning I find one or two dead, though they were practically well the night before. The trouble seemed to occur after feeding green alfalfa.*

We must warn rabbit growers to avoid the use of wet feed. If, as is usually desirable, green feed is given to the rabbits, be sure that they are accustomed to it by gradual introduction of the green feed; and always be sure that no dew or water is on the outside of the grass or alfalfa. The safest way is to wilt your green feed in the sun a little while and keep it under cover, but not in large piles, for it might sweat.

### Rabbit Feeding.

*Are apples, green corn stalks, and corn on the cob good for rabbits?*

All of these things may be fed in small quantities, perhaps without injury, but not as a whole diet.

### Weaning Rabbits.

*When about a month old my little rabbits die. Should I wean them before that?*

The young are greatly benefited by leaving with the doe until six or eight weeks old. Remove one or two each day, selecting the most vigorous at first. This removal on the installment plan seems to better dry up any milk the doe may be supplying the young. Some breeders claim that the rock salt we get here is not safe but that fine table salt in the feed or in bran made a little damp is much better. The salt in the feed of the doe assists in drying her up when removing the young. Simply leaving these youngsters with their dam could hardly be considered the cause of their death—the trouble should no doubt be charged to something else.—Geo. H. Croley.

### Snuffles Incurable.

*What are the cause and cure for snuffles in rabbits?*

From all I have learned I fear very little can be done for the trouble. Indeed some people regard it as almost like tuberculosis—incurable. My judgment is: remove the cause. Take better care of your stock so as to avoid colds, and if one should display symptoms of catarrhal trouble, use the same remedy which would apply in the human family. Yerba Santa is always safe—make a tea of the leaves and mix with bread and milk or bran mash. But I don't encourage experiments with snuffles as I have never known any one to succeed in curing the trouble.—Mrs. B. H. Gilkey, Santa Rosa.

### Slobbers in Rabbits.

*What will cure slobbers in rabbits?*

Slobbers in rabbits is acute indigestion and will prove fatal if prompt measures are not taken to relieve the condition, cabbage or decayed vegetables being nearly always the cause. Give one teaspoonful of muriatic acid to the gallon of water in granite or crockery drinking vessel. Caution must be used in giving the acid. Always use a glass measure for the acid and if not possessing one, a teaspoonful of water in a common tumbler will show what the approximate quantity of muriatic acid looks like. It is well to give all the flock a drink of this sort once in a while as a preventive measure.—Mrs. B. H. Gilkey, Santa Rosa.

Slobbers or snuffles in rabbits is a difficult disease to cure, but it may be prevented from spreading if given prompt attention. It sometimes attacks a lot of rabbits that are properly fed and cared for in the best manner possible, but it is usually due to damp or drafty quarters and first appears in the form of pneumonia. We have heard it stated that it is due to lack of salt; rabbits should be salted at least once a week. A level teaspoonful of salt mixed with a pint of dry bran; the mixture should then be moistened with water until it is thoroughly damp but not sloppy. A number of years ago C. W. Hansen, the well-known fancier of San Mateo, had much trouble with sickness among his Belgian hares. He stated to us that after making it a daily practice to give them a few poplar tree suckers, he never again had a sick hare. These suckers grew abundantly about the base of the tall poplars; they should be fed fresh, including the leaves. Quickly separate the sick animals from those that show no symptoms of the disease. Clean out and whitewash inside, and outside also if possible, all the hutches on the place, using a strong solution of carbolic acid in the whitewash. Thoroughly wash all drinking vessels and feed troughs with a solution of 20 drops of carbolic acid in one gallon of water.—Geo. H. Croley.

### Rabbits Neglect Young.

*Three of my does have twice refused to make nests for their young, and have either neglected or eaten them all. Can you tell me the reason? I feed rolled barley, alfalfa hay, and a little green stuff.*

Not knowing full particulars as to the treatment you give your rabbits, I cannot absolutely state the cause of your trouble. But this I do know; if

a doe is given bedding before the middle of her time, say on the tenth day, she will in all probability prepare her bed about the fifteenth day. Should she do this, never disturb her. Keep her pen clean, leaving the nest intact. When the young are born remove all inferior sized or dead ones. I would advise straw or oat hay or any clean dry stuff free from mildew in place of alfalfa hay. Give water and green stuff, avoiding cabbage and celery or decayed vegetables. Pears and apples are relished, but if given in quantities they are apt to gorge themselves and die suddenly; rolled barley or wheat is all right. Dry alfalfa tends to paunchiness; green alfalfa is fine.—Mrs. B. H. Gilkey, Santa Rosa.

Mice sometimes cause does to neglect the completion of their nests and the lack of preparation for the young influences the doe to devour them.

### Bucks and Does.

*How many Belgian hare bucks are required for twenty-five does?*

The number of bucks required for twenty-five does depends upon the judgment of the owner, and the age before breeding. A buck properly handled should not serve more than one doe a day and then be allowed complete rest for a week or so after breeding about a dozen. One should use discretion in breeding so as to not waste the energy of the male. Two good strong males would be sufficient for your does, provided an accurate record be kept of service and the buck be given plenty of grain. Remember the buck is half of your flock.

### Belgian Hare Production.

*I am intending to raise some Belgian hares and desire information.*

There is a Farmers Bulletin on Rabbit Raising to be obtained free from Bureau of Documents, U. S. Department of Documents, Washington, D. C.

### Alfalfa for Rabbits.

*Recently ten of my rabbits about three months old have died. They sicken suddenly. In every case the liver was very dark, with white blotches. The stomach is usually full of food, and the intestines full of excreta, except in one or two cases when the lower intestines were empty, but distended with gas. The rabbits seem too thin in flesh. I feed alfalfa, rolled barley and occasionally oats.*

If the alfalfa is at fault it must have been because the alfalfa had been fed while there was dew or wet, maybe rain, on it. Then the rabbits have not had variety enough; a little bran, some carrots, or other vegetables would have been much better than just three articles of diet. Turnips and carrots are much relished by rabbits; and as they can be grown the year round in this State, it is poor economy not to raise a few. The trouble evidently was in the bowels and too much green food of any kind is liable to cause bowel trouble.

There is often trouble with alfalfa hay. Oat hay is better. In changing from dry feed to green, however, one must use caution and not give too much. Just a little until they become used to it, as they are apt to overeat and die suddenly. By watching the bowels and not letting them eat too heartily at first, you may in a short time feed freely without danger. Also give good, clean, sweet straw or oat hay, and vegetables, except cabbage.

# PART IX. PESTS AND DISEASES OF PLANTS

## SPRAYS AND POISONS FOR INSECTS.*

Spraying for insect pests has become a very important factor in the growing of a large number of crops and especially in horticultural work. As such it is now a regular and well established business which has received a very large amount of investigational work, with the result that there are today efficient sprays for most of the important ailments a tree or plant is heir to. This is true of both the home-made and commercial products, and it is often an exceedingly difficult task to select a preparation or formula which will give the best results for the outlay of money. It is the desire of the writer to give the formulae and methods of preparation of some of the most important which can be made at home or the equivalents of which may be obtained from commercial manufacturers.

In general insecticides, whether they be liquids, solids or gases, are usually listed in three main classes, viz: arsenical, contact and repellent. The arsenical sprays are used in controlling biting and chewing insects which are capable of taking the poison internally. They are the cheapest and therefore used wherever practical. The contact sprays are for piercing and sucking insects as well as biting and chewing insects which can not be controlled by arsenicals. The gases and repellents are used for all classes of insects; the gases kill directly and the repellents, being distasteful, prevent or repel attacks.

### Arsenical Insecticides.

Paris green and London purple were the first arsenicals used as insecticides, but of late years it has been discovered that lead arsenate and zinc arsenite, while not quite as strong, are much less liable to damage the fruit and foliage and have therefore largely replaced the stronger arsenicals. Paris green, however, is still used for certain insects, and where there is no danger to foliage as in the use of baits, it is used very largely. White arsenic is also used for this purpose and is much less expensive.

Arsenicals are largely used in combating such insects as grasshoppers, armyworms, cutworms, caterpillars, slugs, beetles, or any others which actually eat the foliage or fruit.

---

*This information is compiled from the latest writings of E. O. Essig, instructor in entomology of the University of California.

### Lead Arsenate.

There are two kinds of lead arsenate on the market—the ordinary, or acid, which is generally used and at times causes severe burning to fruit and foliage if applied too strong, and neutral lead arsenate, which is perfectly safe and should be used wherever there is any danger of burning tender fruit and foliage, or usually in combination when other insects or fungi are to be sprayed at the same time.

| | | |
|---|---|---|
| A. | Lead arsenate (paste) | 4 to 8 pounds |
| | Water | 100 gallons |
| B. | Lead arsenate (powder) | 2 to 8 pounds |
| | Water | 100 gallons |

Mix the paste or powder in the required amount of water or first in a small amount and add the remainder for use. See that the mixture is thoroughly agitated when spraying in order to keep the lead arsenate in proper suspension.

Lead arsenate is rendered none the less effective when combined with Bordeaux mixture, iron sulfid or tobacco decoctions, but the acid type should never be used in combination with oil emulsions, soap sprays and doubtfully with lime-sulphur. The neutral type, however, may be used safely with any of the above.

### Paris Green.

If lead arsenate can not be had, Paris green may be used as follows:

| | |
|---|---|
| Paris green | 1 pound |
| Air-slaked lime (or better, dry water-slaked lime) | 5 pounds |
| Water | 200 gallons |

First stir the poison into a thin paste with a little water, add this to the lime, then strain the mixture through a sieve into a tank containing the required amount of water. It is particularly necessary to keep this mixture well agitated while spraying.

As a dust, Paris green is mixed as follows:

| | |
|---|---|
| Paris green | 5 ounces |
| Air-slaked lime | 1 pound |

The Paris green and lime are thoroughly powdered, mixed and dusted upon the plants through a muslin bag or by means of a blower.

Paris green may be effectually used when combined with Bordeaux mixture, but should never be applied in combination with lime-sulphur, soap sprays and emulsions.

### Poison Baits.

Poison baits occupy a very important place in the control of certain insects, such as grasshoppers, armyworms, cutworms, wireworms, etc., and are especially useful to the small gardener, though they have often been used with excellent results in large fields and orchards.

### Poison Bran Mash.

No. 1.

| | |
|---|---|
| Bran | 25 pounds |
| Paris green | ½ pound |
| Cheap molasses | 1 quart |

No. 2.

| | |
|---|---|
| Bran | 40 pounds |
| White arsenic | 5 pounds |
| Molasses | 2 gallons |

In preparing these mix the arsenic or Paris green and bran dry, and add the molasses, which has been diluted in water. Add enough more water to moisten the bran so that it will appear between the fingers when the mixture is squeezed in the hand.

Some prefer to moisten the bran first and afterward stir in the molasses and poison.

### Criddle Mixture.

This mixture is exceedingly cheap and effective, especially for grasshoppers.

| | |
|---|---|
| Fresh horse dung | 60 pounds |
| Common salt | 2 pounds |
| Paris green | 1 pound |

The Paris green is mixed with enough water to form a paste and is then stirred thoroughly into the horse dung with the salt.

These poisoned baits are scattered about in fields infested with grasshoppers, armyworms, cutworms and various other destructive chewing insects, or they may be placed in advance of the oncoming hordes. A very important thing is to see that the poisoned baits are kept moist, as they become worthless when dry. To prevent this drying out the mixture should be put out in small piles and occasionally moistened. They may also be placed under boards or in the shade, while for cutworms and wireworms it is often advisable to bury them in the ground.

### Citric Bran Mash.

A mash recommended by S. T. Hunter and P. W. Claassen has been used in this State very successfully to combat grasshoppers. The formula is in two parts as follows:

Part I.

| | |
|---|---|
| White arsenic (or Paris green) | 2½ pounds |
| Bran | 50 pounds |

Mix these dry.

Part II.

| | |
|---|---|
| Lemons (chopped fine, including rind) | ½ dozen |
| Syrup or molasses (cheap) | 4 quarts |
| Water | 5 gallons |

Mix these together.

Mix Part I and Part II and add enough water to make a wet mash The parts should not be mixed until ready for use. Distribute broadcast in front of the pests early in the morning.

## CONTACT INSECTICIDES—LIQUIDS.

### Lime-Sulphur.

Lime-sulphur is easily the most important insecticidal spray now used, and its fungicidal properties make it even more useful to the orchardist. It is especially valuable for controlling scale insects, the peach twig-borer and fungi on deciduous fruit trees, though if properly weakened it may also be used as a summer spray, particularly for the red spiders and mites.

Formerly lime-sulphur spray was a home-made product, but today the commercially prepared product is so much more convenient than the home-made mixtures and as good as the best that can be made on the farm that the use of the latter has almost ceased.

### Home-Made Lime-Sulphur.

| | |
|---|---|
| Stone lime | 50 pounds |
| Sulphur, flowers of | 110 pounds |
| Water to make | 50 gallons |

Heat in a cooking barrel or vessel about one third of the total quantity of water required. When the water is hot, add all of the lime, and at once add all the sulphur, which should previously have been made into a thick paste with water. After the lime is slaked, another third of the water should be added, preferably hot, and the cooking should be continued for an hour, when the final dilution may be made, using either hot or cold water as is most convenient. The boiling due to the slaking of lime thoroughly mixes the ingredients at the start, but subsequent stirring is necessary if the wash is cooked by direct heat in kettles. After the wash has been prepared it must be strained through a fine sieve as it is being run into the spray tank. The resultant product is a concentrated solution of lime-sulphur, which should be diluted for use as directed in the table for diluting the commercial lime-sulphur, which follows.

### Commercial Lime-Sulphur.

The commercial lime-sulphur is a perfectly clear liquid needing only to be diluted for use. Because of its dependency it is fast replacing the home-made preparations. There are three common brands upon the market in California under the trade names "Rex," "Ortho" and "Orchard," though there are many other brands which may be obtained elsewhere.

In using the lime-sulphur it is very important to have just the right amount of dilution. This is ascertained by the use of a Baumé hydrometer. The following table shows the dilutions for dormant and summer spraying with lime-sulphur mixtures:

| Reading of Hydrometer (Baumé) | Amount of Dilution. Number of Gallons of Water to One Gallon of Lime-Sulphur Solution | |
|---|---|---|
| | For Winter Spraying | For Summer Spraying |
| 36 Degrees | 11 | 46¾ |
| 35 " | 9 | 45 |
| 34 " | 8¾ | 43¼ |
| 33 " | 8 | 41½ |
| 32 " | 8 | 40 |
| 31 " | 7½ | 37¾ |
| 30 " | 7¼ | 36¼ |
| 29 " | 6¾ | 34¼ |
| 28 " | 6½ | 32¾ |
| 27 " | 6 | 31 |
| 26 " | 5¾ | 29½ |
| 25 " | 5¼ | 27¾ |
| 24 " | 5 | 26 |
| 23 " | 4½ | 24½ |
| 22 " | 4¼ | 22¾ |
| 21 " | 3¾ | 21¼ |
| 20 " | 3½ | 19¾ |
| 19 " | 3¼ | 18¼ |
| 18 " | 3 | 17 |
| 17 " | 2¾ | 16 |
| 16 " | 2½ | 15 |
| 15 " | 2¼ | 14 |

### Lime-Sulphur and Flour Paste.

For spraying trees in foliage and tender plants a lime-sulphur flour paste spray has given remarkably good results. The following formulae are recommended:

No. 1.

| | |
|---|---|
| Water | 200 gallons |
| Flour paste, 8 pounds flour in | 8 gallons water |
| Sublimed sulphur | 10 pounds |
| Lime-sulphur solution | 2½ gallons |

The flour is first made into a thin paste by adding one pound to each gallon of water, according to the above formula. The sulphur is made into a paste also and added with the flour paste and lime-sulphur solution to the two hundred gallons of water in the spray tank. This spray is excellent for the red spiders on almond and citrus trees. Minus the lime-sulphur solution it is a very effective spray for the two-spotted mite on hops.

No. 2. (Iron Sulphide.)

| | |
|---|---|
| Water | 200 gallons |
| Flour paste, 8 pounds flour in | 8 gallons water |
| Lime-sulphur solution | 2½ gallons |
| Iron sulphate | 4 pounds |

This spray is mixed as the preceding, and the iron sulphate after being dissolved is added directly to the diluted mixture in the tank.

The above spray is especially recommended for late summer sprayings for red spider on almond and citrus trees, but should not be applied to fruit trees just before the fruit is ready to pick, as the fruit might be stained.

For "self-boiled" lime sulphur see page 228.

Lime-sulphur may be used in combination with tobacco sprays and applied with safety on citrus trees prior to fumigation. It should not be combined with Paris green, acid lead arsenate, zinc arsenite, oil emulsions and soaps. With neutral lead arsenate, however, no damage may result.

### Emulsions and Miscible Oils.

Emulsions are oil sprays in which soap is most frequently used as an emulsifying agent. They have a high power of penetration and a rapid and even distribution over the sprayed surface. With ordinary care they may be readily made at home and are very valuable as insecticides.

In the miscible oils the emulsifier is incorporated in the oil. The proportions must be very exact and vary according to the variation in the composition of the oil and other ingredients, and is therefore not practical to be made at home. The miscible oil sprays are the highest type of emulsions and are almost universally employed for commercial purposes.

### Kerosene Emulsion.

There are two general types of kerosene emulsion, as follows:

Cook Emulsion.—In this emulsion there is a larger amount of soap. It is the easiest to make, slightly more expensive and usually about as effective if made with a good grade of fish oil soap. The general formula is

| | |
|---|---|
| Fish oil soap | 1 pound |
| Kerosene | ½ gallon |
| Water | 2 gallons |

This was the first attempt at making an emulsion of this type and was a great discovery in insect control. It was invented by Dr. A. J. Cook when at the Michigan Agricultural College.

Riley-Hubbard Emulsion.—In this emulsion the proportion of soap does not vary far from ¼ pound to a gallon of oil. It requires very vigorous agitation, the oil going quickly into the creamy condition of the Cook emulsion, but after further agitation it thickens into a clabber-like material. The formula is

| | |
|---|---|
| Fish oil soap | ½ pound |
| Kerosene | ½ gallon |
| Water | 1 gallon |

Preparation.—The preparation of both of the above emulsions is about the same and consists in first dissolving the soap in the hot water, after which the kerosene is added and the whole thoroughly and vigorously

agitated by pumping it into itself until a thick creamy liquid results. Soft water should be used wherever possible, as it is almost essential to obtaining a proper emulsion.

For use on dormant trees and plants in the winter dilute the stock solution one to five of water. On trees or plants in foliage dilute with ten parts of water.

### Distillate Emulsion.

| | |
|---|---|
| Distillate (28 degrees Baumé) | 20 gallons |
| Whale oil soap | 30 pounds |
| Water to mix | 12 gallons |

Dissolve the whale oil soap in the water, heating it to the boiling point; add the distillate and agitate thoroughly while the solution is hot. For use add twenty gallons of water to each gallon of the above mixture.

### Carbolic Acid Emulsion.

| | |
|---|---|
| Whale oil soap | 40 pounds |
| Crude carbolic acid | 5 gallons |
| Water to mix | 40 gallons |

Dissolve the soap in hot water (the soap must be entirely dissolved); add the carbolic acid and heat to the boiling point for twenty minutes (reserve some water to add in case the mixture begins to boil over). For use add twenty gallons of water to every gallon of the above stock solution. The emulsion needs little or no agitation.

This spray is especially recommended for mealy bugs, but is also suitable for plant lice and soft brown scale. It is also a good contact insecticide for ants.

### Crude Oil Emulsion.

| | |
|---|---|
| Water | 175 gallons |
| Liquid soap | 3 gallons |
| Crude oil (21°–24°) | 25 gallons |

Fill the spray tank with the 175 gallons of water; add the liquid soap; agitate thoroughly for one minute, after which add the crude oil, continuing the agitation.

If the liquid soap can not be had, use twenty pounds whale oil soap, dissolve in ten gallons of boiling water, to which three pounds of lye have been added.

During the spraying operation this mixture should be thoroughly agitated and great care taken to wet all of the twigs. From eight to fifteen gallons should be used on a tree. The application should be made from November to February.

The crude oil emulsion is especially recommended for black scale, European fruit Lecanium, European pear scale, cherry scale and other scales infesting deciduous fruit trees. It should be applied in the winter, when the trees are dormant.

To also kill moss or lichens on fruit trees add two pounds of lye to the formula of the stock solution.

### Distillate Oil Mechanical Mixture.

| | |
|---|---|
| Water | 200 gallons |
| Caustic soda (95 per cent) | 7 pounds |
| Distillate (28 degrees Baumé) | 10 gallons |

Fill spray tank with the required amount of water; add the distillate and caustic soda, which has been dissolved in a small amount of water. Keep agitator going rapidly while applying the spray.

This spray has been thoroughly tested by the writer and is one of the cheapest and best for spraying black scale or the European fruit Lecanium on apricot and olive trees.

### Distillate Emulsion and Tobacco.

| | |
|---|---|
| Water | 12 gallons |
| Whale oil soap | 30 pounds |
| Distillate (32° to 34° Baumé) | 20 gallons |

This is the "Government Formula for Pear Thrips." The emulsion is prepared in the ordinary way as a stock solution. For use in the orchard dilute one to twenty parts of water. To every two hundred gallons of this diluted spray add one pint of tobacco extract containing forty per cent nicotine or about three and one half gallons of tobacco extract containing two and three-quarters per cent nicotine. This spray is especially recommended for pear thrips.

### Rosin Wash.

Though not a true emulsion and fast losing prominence as a spray, this wash is included here because of its value as a spray and dip for plants with tender foliage.

| | |
|---|---|
| Rosin | 10 pounds |
| Caustic soda (76 per cent) | 3 pounds |
| Fish oil | 1½ pounds |
| Water | 50 gallons |

Put oil, rosin and a gallon of water in an iron kettle and heat until the rosin is softened; add the caustic soda (dissolved in a small amount of water) and stir thoroughly, after which add enough water to make fifty gallons of spraying material.

This wash is only effective for young scale insects, plant lice, or other soft-bodied insects.

### Soap Washes.

A simple and easily prepared spray for use in small gardens is made from soap as follows:

| | |
|---|---|
| Whale oil or hard laundry soap | 1 pound |
| Water | 5 gallons |

The soap is first dissolved in a small amount of hot water and the remainder added afterward. This spray will not injure tender plants or foliage, and is recommended only for young scale insects, plant lice and other soft-bodied insects.

### Soap Powder.

Among the recent commercial insecticides is a soap powder which readily dissolves in hot or cold water and has very good insecticidal powers. The amount of dilution varies with the product, but is usually one pound to five or six gallons of water or as stated on the container.

### Tobacco Decoctions.

For soft-bodied insects in greenhouses, conservatories, or on house plants, as well as for plant lice, leaf-hoppers and other similar insects in the open, the tobacco decoctions are invaluable because they do not injure the foliage and give excellent killing results. For home-made extract, take

Tobacco leaves or stems.....1 pound
Water .....4 gallons

Steep the tobacco in the hot water and apply directly.

The commercial extracts containing two and three-quarters per cent nicotine should be diluted to sixty parts of water. The extract containing forty per cent nicotine should be diluted from one to one thousand parts or one to fifteen hundred parts of water.

## DUSTS.

A number of valuable insecticides are applied dry as dusts. We have already referred to Paris green and lime as being used in this way. Dusts are easy to mix and handle and are often of great service to the farmer and orchardist.

### Flowers of Sulphur.

For a number of years flowers of sulphur was used alone as a remedy for mites on citrus and almond trees. It was distributed over the trees by hand or with a blower in the early morning when the foliage was damp, thus enabling it to adhere. The warm sunshine volatilizes some of the sulphur and oxidizes a part so as to liberate two gases, which are killing factors. Accordingly sulphur is of little avail in the cool summer weather of the coast counties or during the winter months anywhere. However, in the warm interior districts this is still a very effective remedy for mites.

### Sulphur and Lime.

Even better than sulphur alone is hydrated lime and flowers of sulphur mixed in equal parts and blown upon the trees with a power machine. In the citrus orchards this is a very important method of controlling the citrus red spider and the two-spotted mite.

### Lime, Sulphur and Sal Bordeaux.

This mixture is prepared as follows:

Hydrated lime (dry, finely powdered, water-slaked lime).40 pounds
Flowers of sulphur ..... 5 pounds
Sal Bordeaux (a mixture of bluestone, charcoal and naphthol). . ..... 5 pounds

Mix these ingredients thoroughly and apply with a power blower. This is one of the most efficient preparations now being used in controlling the red spider of deciduous trees.

### Milled Sulphur.

This is sulphur to which something else is added to make it possible to grind it exceedingly fine. It is known by the trade names, atomic sulphur and diatomic sulphur. It is very good for red spider and mites.

### Pyrethrum.

This is commonly known as Persian or Dalmatian insect powder, or Buhach, and comes as a finely ground yellow powder with a pleasant, rather pungent odor. Unfortunately it is not only expensive but quickly loses its effectiveness when exposed to the air. Its practical range is therefore limited, and it is chiefly used on house plants, in the conservatory and in the garden. It is entirely harmless to vegetation of all kinds and does not spot or mark even the most delicate flowers when used dry. It acts a little more promptly and effectively if applied to the insects while they are moist, or at least damp. If the dusty appearance is objectionable, a decoction may be made by steeping one ounce in one quart of boiling water, and then adding two or three quarts of cold water. Into this material potted plants may be dipped, or it may be applied with an atomizer. For plant lice on house plants this makes a very clean and effective application.

### Hellebore.

Powdered white hellebore has been used for many years as a specific remedy against "currant worms," "rose slugs" and other saw-fly larvæ, and is very effective, either dusted on as a powder, or in the form of a decoction. When applied, it may be used pure, or it may be mixed with two or three times its own weight of dust, cheap flour, lime, or almost any other light, finely powdered material. When used as a spray, steep one ounce in one quart of boiling water and add another quart of cold water when ready to apply.

It is also quite effective against certain root maggots, like those affecting cabbage and cauliflower. For these it is used in the form of a decoction, one ounce in one gallon of water and about half a pint poured around an infested plant, from which the earth has been drawn away to facilitate soaking directly around the plant. To be effective, the material must be brought into direct contact with the insects. Hence, it should be liberally used and applied before the maggots get down too far, or into the plant too deeply. In the garden its use is quite practical; in the field it has not been found so satisfactory.

## REPELLENTS.

It is apparent that certain materials, applied to the foliage of plants, are somewhat repulsive to some insects. One of the most important of these repellents is the well known fungicide, Bordeaux mixture.

### Bordeaux Mixture.

The formula and method of preparation and use are given on pages 226 and 227. As an insect repellent it is used for the flea-beetles, cucumber beetles, diabrotica, and other leaf-eating insects.

Bordeaux mixture may be used in combination with Paris green, lead arsenate (acid and neutral), calcium arsenite and in some instances with rosin soap for special purposes, but should not be combined with tobacco or used prior to fumigation.

### Bands.

To prevent insects from crawling up the trunks of trees and plants various bands have been devised which have proven exceedingly successful in many instances.

Tanglefoot.—Tree tanglefoot is a thick, sticky substance which, when applied as a band, remains moist for several weeks and is a very effective barrier against cankerworms, caterpillars, cutworms, Fuller's rose beetle and other crawling insects. The material is put up in cans. It should be applied directly to the trunk of the tree several feet above the ground.

Sticky Rope.—In the work on the California tussock moth, W. H. Volck recommends the use of rope bands saturated in an easily prepared mixture as follows:

| | |
|---|---|
| Castor oil | 1 gallon |
| Rosin | 16 pounds |

The rosin and castor oil are gently heated until the former is completely melted. If too thick more oil may be added. The bands dipped in this mixture should be replaced by new ones about every ten days. Crude oil rich in asphaltum or a mixture of equal parts of pine tar and molasses have also given satisfactory results.

Cotton Bands.—Bands of loose cotton fastened around the trunks of the trees are excellent in preventing the ascent of insects.

Oiled Paper.—Oiled paper tied around the trunks of small vines and plants is an old method which sometimes proves practical today.

### Whitewash.

Besides being used as a direct insecticide in many cases whitewash is often used indirectly to protect the trees against sunburn and thus ward off attacks of borers which seek entrance at any weakened place. There are many formulæ for preparing this mixture, two of the more important of which are given below. First, ordinary whitewash:

| | |
|---|---|
| Water | 2 gallons |
| Quick lime | 10 pounds |

The lime is placed in a pail and the water added, after which the pail is covered with a couple of canvas sacks or heavy material and allowed to stand for an hour. If the lime is transparent and lumpy it has been scorched, due to the lack of sufficient water. After slaking add enough water to bring it to a brush consistency.

A more durable weatherproof whitewash is prepared as follows:

| | | |
|---|---|---|
| (1) | Quick lime | 62 pounds |
| | Water (hot) | 12 gallons |
| (2) | Common salt | 2 pounds |
| | Sulphate of zinc | 1 pound |
| | Water (boiling) | 2 gallons |
| (3) | Skimmed milk | 2 gallons |

Slake the lime thoroughly in (1); dissolve the salt and sulphate of zinc in two gallons of water (2); pour (2) into (1) and add (3). Mix thoroughly. Two pounds of flour paste (dissolved in two gallons of hot water) may be added instead of the skimmed milk.

## FUMIGATION.

Fumigation consists in the generation and uses of gases to kill pests. Formerly such practices were limited to the uses of carbon bisulfid, sulphur dioxid and tobacco fumes. The use of hydrocyanic acid gas in citrus orchards has lately been so perfected as to become of very great importance and has opened up a remarkable field in the control of orchard pests.

### Carbon Bisulfid.

Carbon bisulfid is a liquid which evaporates into a heavy, highly inflammable and explosive gas. It was first used for fumigating beans, grains or cereals for weevils, and is still a very efficient method of controlling such pests. In handling the liquid great care should be taken to keep it away from a flame on account of the vapor being highly explosive.

For Storehouse Pests.—Before fumigation is begun care should be taken to see that the room or container is made as tight as possible. The temperature should be 70 degrees Fahrenheit or above, for poor and unsatisfactory results are sure to follow even excessive doses at a lower temperature. In a tight compartment five pounds of carbon bisulfid to every 1,000 cubic feet of air space will give excellent results in killing weevils. If the compartments can not be made tight, increase the amount of the fumigant.

For Root Pests.—Carbon bisulfid has also been used in the fields to kill root pests like the woolly apple aphis, black peach aphis, grape phylloxera, white grubs, root-maggots, but is far too expensive to be practical and is effective only in soils of just the right degree of porosity. For a small plant, a hole is made in the ground near the base and a teaspoonful of the liquid poured into the hole, which is covered to prevent surface evaporation. For larger plants several holes are made deep enough to allow the vapor to disseminate around the infested roots. A syringe-like instrument is sometimes used to inject the liquid into the soil around the roots of the infested plants. In all such work care must be exercised in making the applications or the plants may be killed by an excessive dose or by the carbon bisulfid coming in direct contact with the roots.

For Wood-Borers.—Carbon bisulfid is also injected into the burrows of wood-boring insects with some success, but this method has never met

with much favor, perhaps because in many cases the burrows are open only after the damage has already been done and the insects escaped.

For Ants' and Wasps' Nests.—A small amount of carbon bisulfid poured into the underground nests of ants, wasps, yellow jackets and other insects of like habits will usually exterminate the colony. This method, however, is of little avail against the Argentine ant, because of the many small nests.

### Tobacco Fumes.

For very tender house and greenhouse plants infested with plant lice, thrips and other small insects or mites, it is sometimes advisable to fumigate them with slowly burning tobacco, to avoid injury to the foliage, but even in such cases hydrocyanic acid gas, if properly handled, is much better and is gradually replacing the tobacco punk and other commercial fumigants of a similar nature.

### Hydrocyanic Acid Gas.

Hydrocyanic acid gas is usually generated by the addition of cyanide to diluted sulphuric acid. The generation is made in an earthenware jar, or in a special fumigating machine, the gas being confined in a fumigating house, or, as is more often the case in California, in a tent thrown over a tree. Any one desiring to use this form of fumigation should apply to C. W. Woodworth, Professor of Entomology, Berkeley, for detailed publications.

## FUNGOUS DISEASES AND FUNGICIDES.*

Professor R. E. Smith of the University of California points the purposes of fungicides in this way: "It should be clearly understood that all control of plant diseases by spraying, dipping, disinfecting, etc., must be accomplished entirely by prevention rather than cure. In other words, these fungicides, to be effective, must be applied for the purpose of poisoning and killing the spores or germs of the parasites and thus preventing their further spread and development."

### Bordeaux Mixture.

Bordeaux mixture continues to be the most generally used of all fungicides. Its effectiveness and harmlessness to plants depends upon care used in its manufacture, on condition of atmosphere and of plant. The formula ordinarily used, the 5-5-50, is entirely harmless when the plant is dormant. It may also be used on some growing plants; others it will kill or greatly injure. It may be used even stronger than the formula given when the plant is dormant, but these proportions are effective with most fungous troubles. By the 5-5-50 formula is meant:

*Chiefly as stated by W. H. Volck, horticultural commissioner of Santa Cruz County.

(a) Copper sulphate ..... 5 pounds
Stone lime ..... 5 pounds
Water .....50 gallons

The weaker solution is

(b) Copper sulphate ..... 3 pounds
Stone lime ..... 5 pounds
Water .....50 gallons

If hydrate of lime is used add one-fourth more.

To mix, dissolve the copper sulphate with water in proportion of one pound of sulphate to sufficient water to make one gallon of solution for each pound of sulphate used. The stone lime may be slaked and dissolved in water in the same proportions as the sulphate. This gives convenient stock solutions, every gallon of which contains one pound of lime or of sulphate. To make the mixture from these stock solutions take, say, five gallons of the lime solution which will contain five pounds of stone lime, and five gallons of the sulphate solution which will contain five pounds of copper sulphate. Five gallons of each of these two solutions may now be mixed with water by pouring through a strainer into water sufficient to make fifty gallons. Do not mix the solutions before pouring into the water.

### Bordeaux Paste.

The latest and best cure for gum disease recommended by Mr. Fawcett:

Blue stone .....1 pound
Fresh burned lime .....2 pounds

Dissolve the blue stone in one gallon water, using wooden or earthen vessel by hanging it in the top of a sack; slake the lime in about one-half gallon of water. Stir together when cool, making a mixture about the consistency of whitewash. Apply with a brush. This may also be applied to healthy bark as a preventive against new infections. Mix fresh each day or two, as mixed paste deteriorates rapidly.

### Ammoniacal Copper Carbonate.

Copper carbonate ..... 5 ounces
Ammonia (26° Baumé) ..... 3 pints
Water .....50 gallons

The strong ammonia, which must be handled carefully, may be diluted to about five times its volume, and the copper carbonate may be rubbed up with water in a small vessel to form a thin paste. Add this paste to the dilute ammonia by constant stirring. Then add water sufficient to make fifty gallons. Use as promptly as possible owing to rapid evaporation of ammonia.

### Potassium Sulphide.

Potassium sulphide ..... 6 ounces
Water .....100 gallons

This is employed when coloring of foliage is not desirable.

### Copper Sulphate.

Copper sulphate ..... 1 pound
Water .....15 gallons

For use on dormant trees or for disinfecting seeds copper sulphate without lime may be employed. The stock may be mixed as for Bordeaux. On growing plants it may be used with a reasonable degree of safety at the rate of one pound to 100 gallons of water.

### Corrosive Sublimate.

Corrosive sublimate ..... 2 ounces
Water .....15 gallons

Corrosive sublimate or bichloride of mercury, one of the deadliest of poisons to animal life, is a very effective disinfectant and fungicide. It is one of the best preventives of potato scab. This is one of the solutions used after pruning for antiseptic dressing of wounds of trees affected with blight. It should be made and kept in wooden or earthen vessels.

### Formalin.

Formaldehyde vapor dissolved in water in what is usually called the 40 per cent solution is one of the best fungicides and is often used in place of corrosive sublimate. It is also used for treating seed potatoes, oats and wheat. It should be employed in strength of

Formalin .....1 ounce
Water .....2 gallons

### Flowers of Sulphur.

Flowers of sulphur (use high-grade) is effective on surface mildews when dusted over the plant when leaves are moist. Sulphuric acid 1-1000 has also proven successful on rose mildew and similar fungi. Likewise milled sulphur.

### Self-Boiled Lime-Sulphur.

Flowers of sulphur..... 8 pounds
Lump lime ..... 8 pounds
Cold water .....50 gallons

Place the lime and sulphur together in a barrel and add just enough cold water to slake the lime, stirring constantly to prevent burning. Keep a piece of old carpet or burlap sack over the top of the barrel to retain all the heat possible. Watch the mixture carefully and as soon as an orange colored liquid starts to gather on the surface add the rest of the water. Strain through a fine sieve to remove the particles of lime, but work all the sulphur through.

Do not use hot water or allow the mixture to stand after the lime is slaked and before dilution. In this spray we do not want the soluble sulphides (orange colored) to form, for these will injure the foliage and fruit.

## TREATMENTS FOR PESTS AND DISEASES.*

### Apples, Pears and Quinces.

Aphis, Green.—Apply lime-sulphur just before buds open, if orchard has been badly infected in past years. Apply kerosene emulsion or tobacco washes as soon as the insects make their first appearance.

Aphis, Leaf-Curling.—Lime-sulphur plus Black Leaf 40, one pound to 100 gallons. Apply when the buds are beginning to open, pink showing in a few blossoms; spray very thoroughly.

Aphis, Woolly.—Spray with kerosene emulsion or tobacco washes whenever this pest appears above ground. Use at least 200 pounds pressure. For underground forms remove soil until upper roots are exposed at the base of the tree. Pour several gallons of tobacco wash around crown and replace soil when it has soaked in. Repeat often.

Bud Moth.—Use lime-sulphur in winter, and before leaf buds open and after blossoms fall. Repeat every ten days if necessary.

Brown Apricot Scale.—Apply kerosene or distillate emulsions just as soon as the leaves fall. Applications should be made before December 1st.

Codling Moth.—Apply lead arsenate just as soon as blossoms fall. Continue to spray at intervals of ten days or two weeks throughout the season (at least four times).

Canker Worms.—Apply lead arsenate when the worms first appear. Spray as often as needed. Tanglefoot bands on the tree are very effective in keeping the caterpillars from the trees.

Tussock Moth.—Spray in full bloom with zinc arsenite, six pounds to 200 gallons, and follow in ten days with neutral lead arsenate, fifteen pounds to 200 gallons.

Greedy Scale.—Apply lime-sulphur when trees are dormant. This scale seldom needs treatment.

Oyster Shell Scale.—Apply lime-sulphur when trees are dormant.

Pear Slug.—Dust on Paris green or other arsenicals, hellebore or Pyrethrum.

San Jose Scale.—Apply lime-sulphur when trees are dormant. Repeat in spring.

Thrips.—Spray with distillate emulsion and tobacco when the insect appears in the spring abundantly.

Black Spot Canker.—Apply Bordeaux mixture, the first and fifteenth of November.

Bitter Rot.—Apply weaker Bordeaux at first appearance of rot. Repeat every two weeks if needed.

Moss or Lichens.—Apply crude oil emulsion and lye when trees are dormant.

*Adapted from the writings of W. H. Volck, Horticultural Commissioner, Santa Cruz County.

Pear Blight.—No spray effective. The only treatment consists in cutting off blight as fast as it appears. Cut below affected parts so that good live wood is secured. Sterilize implements after each cut by dipping them in corrosive sublimate.

Apple Mildew.—Cut off infested tips both winter and summer, also prune back all twigs somewhat as apricots are pruned. Spray with milled sulphur in spring.

Sappy Bark.—Cut away diseased parts when trees are dormant.

Scab.—Apply strong Bordeaux before buds start. Spray again with weaker Bordeaux as soon as the blossoms fall. Repeat several times at intervals of three or four weeks. (This should be done especially if the weather is damp.)

### Citrus Fruits.

All scale insects and mealy bugs on citrus trees, commercially grown, are fought by fumigation with hydrocyanic gas, which see on a previous page.

Fuller's Rose Beetle (Aramigus fulleri).—This insect cannot fly and can be kept from the trees by means of tanglefoot bands.

Orange Aphis.—Spray with kerosene emulsion or tobacco extract as soon as found.

Red Spider (Tetranychus mytilaspidis.—Apply milled sulphur or dilute commercial lime-sulphur when foliage is damp. Repeat until pests disappear. A new practice which has given excellent results is obtained by adding flour to the spray as follows: four pounds flour to 100 gallons water. Make a paste of the flour, using the proportion of one pound flour to one gallon cold water, strain and add in proportion required to each tank of spray material. The advantage in using flour is that it prevents the spotting so often noted in use of lime-sulphur spray, which injures the fruit, and spreads in a thin film over the tree.

One pound of dextrine to 100 gallons of water may be used in place of the flour.

White Cottony Cushion Scale.—This pest is handled perfectly by its natural enemy, Novius cardinalis, commonly called the "Vedalia," which may be had from the State Insectary, Sacramento. Release colony at any time of year scale appears.

White Fly.—Defoliate trees when the larvae appear and scrub with soap washes. Better to fumigate with hydrocyanic gas.

Thrips.—Spray with tobacco extract in spring.

Army Worms.—Apply poison baits under trees; also if they have not already secured access to orchard, surround trees with deep furrow, vertical side toward trees. If cover crops are growing, remove such growths as project up into branches of the trees. Paint tanglefoot bands around tree trunk.

Brown Rot.—Sow cover crop in orchard. Plow under in spring and cultivate well under the trees. In washer use bluestone, or

permanganate of potash. Eliminate infected fruit and disinfect boxes and picking sacks.

Dieback (Bacterial).—Improve physical conditions of trees by deeper and more thorough tilling of soil. If excessive applications of nitrogenous fertilizers have been made, discontinue until tree has resumed normal conditions.

Mottle Leaf (Physical).—Improve physical condition of tree by deep culture. Make applications of lime and manure to soil. Examine soil as to hardpan, and if it exists, break up if possible.

Smut.—A fungous growth caused by honey dew exuded by scale insects, plant lice and white fly. Remove pest and smut will disappear.

Wither Tip.—Apply Bordeaux as soon as it appears and repeat as often as necessary.

### Olive.

Black Scale.—Best treatment, fumigation, October-January. If sprayed use resin wash or distillate emulsion. Annual spraying not effective. When young insects appear in large numbers on leaves and stems apply spray. Two or three sprayings may be necessary in some years; in others none.

Twig Borer.—Cut off twigs and prune.

Dry Rot of Fruit.—Keep trees free from other pests, well pruned out so as to admit light and air.

Olive Knot.—A bacterial disease in the form of a woody tumor. Attacks most vigorous trees. Distributed principally by pruning tools. After pruning dip tools in corrosive sublimate. Cut off all tumors, removing the entire twig when possible, and burn.

Peacock Leaf Spot.—Fungus on leaves and fruit. Spray with Bordeaux.

### Peach, Nectarine, and Apricot.

Aphis, Black Peach.—For those above ground use kerosene emulsion or tobacco wash. Destroy the underground forms by pouring carbon bi-sulphide into holes in the ground (made by a crowbar) six inches to six feet away from the tree and about two feet apart. Pour 21 around base of tree often.

Apricot Scale.—Apply distillate emulsion or tobacco washes just as soon as the leaves fall. All applications should be made before the first of December.

Black Scale.—Same as Apricot Scale.

Borer, Peach Tree.—Dig out and kill, or destroy by inserting a flexible wire into their burrows. A strip of asphaltum six inches wide on butt of tree is also used.

Bud Moth.—Use lime-sulphur during winter months when tree is dormant. Use lead arsenate just before leaf-buds open and just after blossoms fall. Repeat every ten days if necessary.

San Jose Scale.—Spray with lime-sulphur when trees are dormant.

Twig Borer.—Spray with lime-sulphur just when buds are swelling.

Blight, Peach.—Spray last of November or before December 15th with Bordeaux or dilute lime-sulphur.

Curl Leaf.—Spray thoroughly with Bordeaux. Later sprayings should be made with weaker Bordeaux.

Shot-hole Fungus.—Spray with Bordeaux about ten days before buds open and with weaker Bordeaux when fruit is about one-fourth grown.

### Cherries, Prunes, Plums.

Cherry Slug.—Feed upon the upper surfaces of the leaves, exposing the veins. Spray with lead arsenate or dust dry arsenate liberally upon the trees as soon as slugs appear.

Prune Aphis.—Spray in the fall with lime-sulphur and as soon as the lice appear with kerosene emulsion or tobacco wash.

Peach Root Borer.—See same under Peach.

Canker Worm. See same under Apple.

Brown Day Moth.—Attacks particularly the prunes and cherries. Spray with lead arsenate as soon as larvae appear.

Red Hump (Schizura concinna).—Spray early with lead arsenate. Burn cocoons.

Brown Rot or Fruit Mold.—Produces a rot on the fruit. Spray with Bordeaux early in the spring, and with weaker Bordeaux as soon as the buds begin to open.

Leaf Curl or Witches Broom.—Cut out and burn infested parts. Spray with Bordeaux early, and with weaker Bordeaux as soon as the buds begin to swell.

Leaf Spot or Shot Hole.—Produces a shot-hole effect upon the leaves. Spray in early spring with Bordeaux, when the buds begin to open with weaker Bordeaux, and when the fruit is one-fourth grown with weak Bordeaux.

Powdery Mildew.—Appears on the leaves late in the season. Spray as soon as found with Bordeaux and repeat if necessary.

Crown Gall.—If on young trees recently set from nursery, remove and burn. If bearing trees, chisel away until only the healthy wood remains. Paint with Bordeaux paste. Watch for a reappearance and treat as before.

Gummosis.—Dig out the gum pockets and wash out with Bordeaux paste.

### Nuts.

Aphis.—In winter spray with lime-sulphur. For summer spraying use emulsions or tobacco washes.

Walnut Scale.—Spray with lime-sulphur or crude oil, when the trees are dormant.

Red Spider of Almonds.—Spray with lime-sulphur, using very weak solution, say about 1-33, or sulphur thoroughly.

Crown Gall.—If young trees, dig up and burn; if older, treat with Bordeaux paste, chiseling down to healthy wood.

Dieback.—A physical disturbance caused by unnatural soil conditions.

Walnut Blight.—Sprays ineffective. The only treatment is prevention by using resistents.

### Grape.

Grape Phylloxera.—Attack roots and foliage of the vines. Plant resistent stock. Be sure of your nursery stock.

Vine Hopper.—Infests foliage of the vines. Use hopper-doser in spring before adult females deposit their eggs. Spray as soon as the young begin to appear with distillate emulsion.

Grasshoppers—Use poison baits.

California Root Worm.—A black beetle whose larvae attack the leaves, stems, petioles, roots and fruit of the vines. Cultivate deeply around the base of the vines. Spray with lead arsenate as soon as beetles appear.

Flea Beetle.—It infests the foliage and may be handled by spraying liberally with lead arsenate.

Hawk Moth.—The large green larvae of this moth feed upon the foliage. Hand pick, or if too numerous spray with lead arsenate.

Grape Leaf Folder.—The larvae roll themselves up in the leaves, which they eat. Spray with lead arsenate.

Erinose.—This so-called disease is produced by a small mite, which is characterized by forming swellings upon the upper surfaces of the leaves. Dust plants liberally with sulphur when they are wet with dew.

Nematode Root Gall.—A minute worm attacking the small roots. Destroy all infested vines. Sterilize soil with carbon bisulphide. Plant only hardy varieties where this exists.

Powdery Mildew.—Grows upon the canes, leaves and fruit. Dust often with sulphur as soon as the disease appears. Spray early with Bordeaux.

Downy Mildew.—Attacks all green portions of the plant—leaves, young shoots and berries. Spray with weak Bordeaux as soon as first appearance is made.

### Blackberries, Raspberries, Loganberries, Strawberries.

Rose Scale.—A white scale thickly infesting the canes just above the surface of the ground. Spray with lime-sulphur or kerosene emulsion.

San Jose Scale.—A small scale badly infesting the canes, particularly of the raspberry. Spray with lime-sulphur.

Strawberry Plant Louse (Myzus fragariafoliae).—A light yellow louse attacking the buds, blossoms and young fruit. Spray with kerosene emulsion or tobacco washes.

Orange Rust.—Forms orange-red colored masses on the leaves, which finally kill the plant. Dig out and burn all diseased plants as soon as rust first appears.

Leaf Spot of Blackberry and Raspberry.—Produces small pale spots on the leaves. Spray with weaker Bordeaux when leaves are half grown and repeat every two weeks if necessary.

Leaf Spot of Strawberry.—This disease first appears as small discolored spots upon the leaves, which destroy the tissues of the plant. Spray before the flowers open with weaker Bordeaux. If the disease appears late, mow off and burn the leaves. Spray the newly appearing leaves with weaker Bordeaux.

Powdery Mildew of the Strawberry.—Produces a whitish powdery covering on the foliage which soon kills the plant. Dust with sulphur when the plants are wet.

Crown Gall.—Affects, especially, the blackberry. Dig vines as soon as this trouble appears; there is no cure. Secure new, clean stock and plant on fresh ground.

### Currants and Gooseberries.

San Jose Scale.—A small scale infesting the stalks. Spray when dormant with lime-sulphur.

Currant Stem Borers.—Small white larvae which bore into the stalks of the plants. As a preventive, wash plants in the spring with soap solution.

Imported Currant Worm.—Attacks the leaves in the spring. Dust plants with Paris green or hellebore when they are wet, or spray with same.

Leaf Hopper.—Usually appears in great numbers on the undersides of the leaves. Spray with distillate and potash as soon as the first ones are noticed.

Currant Leaf Louse.—Usually works upon the ends of the tender shoots and stunts their growth. Spray with distillate emulsion.

Leaf Spot.—Produces large pale spots with brown borders upon the leaves. Spray with Bordeaux as soon as first spots appear and repeat as often as is necessary to keep down the disease. Spray with weaker Bordeaux twice after fruit has been removed.

Anthracnose of Currant.—Produces small brown spots upon the leaves, petioles, young canes, fruit stalks, and fruits. Spray with Bordeaux before leaves appear and with weaker Bordeaux while leaves are unfolding and repeat every three weeks until fruit ripens.

Gooseberry Mildew.—Produces a mildew upon the stems, leaves, and particularly upon the berries, causing them to spoil. Spray with

weaker Bordeaux just as the buds are breaking open and repeat every twelve days until about July 1st. Spray plants in winter with lime-sulphur.

### Peas, Beans, Vetch, Clover, Alfalfa.

Wireworms.—Affect beans and many other garden plants. Rotation of crops to starve out the infestations is perhaps the best treatment. Where this cannot be done, use of the carbon bisulphide in sandy ground is advised. Fertilize with nitrate of soda or kainit.

Bean Aphis.—Works on the leaves, young shoots and tender pods, causing much damage. It is usually cared for by an internal parasite and by a predacious ladybird, but if it becomes too destructive spray with kerosene or tobacco washes.

Green Pea Aphis.—Also attacks vetch, geraniums, malva and many other plants. Spray with kerosene or tobacco washes.

Cut Worms.—Do great damage to all crops at certain seasons. Plow around field so as to have straight side of furrow next to crop. Use poison baits.

Grasshoppers.—Are very difficult to handle. Poisoned baits have given good results. Fall plowing of breeding grounds essential.

Weevils.—Fumigate seed with carbon bisulphide and be sure that no infested seed is planted. Test by placing in water; infected seeds will float.

Bean Anthracnose.—Produces brown sunken areas upon the pods. It also attacks the young plants. Treat seeds with formalin before planting. Spray with Bordeaux as soon as young seedlings are well under way. Repeat if necessary. Practice clean cultural methods.

Bean Blight.—Attacks pods and produces wrinkled and distorted seed. Treat seed with formalin before planting.

Rust.—Produces rust colored spots on foliage. Spray with weaker Bordeaux. Burn all infested plants.

Downy Mildew.—Turns foliage dark and causes it to wilt and die. Select clean seed. Spray with Bordeaux.

Pea Mildew.—Appears early and late, covering plant with a white felt-like powder. Spray with weak Bordeaux or dust with sulphur.

### Onions, Leeks, Garlics, Etc.

Onion Thrips.—Attack the leaves and flowers, causing considerable damage in some localities. Spray with kerosene emulsion as an insecticide and with Bordeaux as a repellent.

Downy Mildew.—Produces a white mould on the leaves, causing them to wilt and die. Spray with Bordeaux.

Onion Smut.—First appears in the form of dark spots upon the leaves and later as longitudinal rifts upon the bulbs. The following

drilled into the soil at the rate of 150 pounds per acre has given good results: lime 50 pounds mixed with sulphur 100 pounds. Also treat seed with formalin as they are being drilled into the soil.

### Cabbage, Cauliflower, Kale, Turnip, Radish, Mustard.

Harlequin Cabbage Bug.—Attacks all cruciferous plants, cultivated and uncultivated, as well as many other hosts. It is no little difficulty to keep these insects from taking a crop, but by observing the following they may be held in check: Keep weeds from the fields at all times; plant late trap crops of kale or cabbage and burn them when they become infested, or kill the bugs with pure kerosene. Hand pick adult insects as soon as they first begin to appear. Spray with kerosene emulsion.

Cabbage Aphis.—Attacks a wide range of cruciferous plants, cultivated and uncultivated. In time, it is subdued by parasitic and predacious enemies, but often not until it has done great damage. It can be controlled by spraying with emulsions or tobacco washes.

Cabbage Worms.—These green worms do great damage by destroying, for market, great quantities of cabbage and cauliflower. As a repellent apply white hellebore; as an insecticide apply resin wash.

Club Root.—A disease producing peculiar enlargement of the roots, giving the plants an unhealthy appearance and finally causing their death. The disease may be carried over in the soil, so the following has been recommended as a means of control: Lime the soil at a rate of 100 bushels per acre, every few years. Rotate crops. Employ clean culture methods.

Black Rot.—A bacterial disease first producing a burnt margin on the leaves and finally causing them to drop. The disease is readily carried from year to year in the seed. Before planting treat the seed with corrosive sublimate or formalin. Eliminate infected plants as soon as they appear in the beds. Rotate crops.

### Tomato, Potato, Egg-Plant, Tobacco, Etc.

Tomato Worms.—These large green caterpillars feed upon the foliage and are easily recognized. Due to their large size, it is very effective to hand pick the infested area. If very numerous spray with arsenate of lead.

Flea Beetle.—A very small beetle which works on the leaflets. As a repellent spray with weak Bordeaux; for an insecticide, arsenate of lead.

Twelve Spotted Cucumber Beetle.—A small green beetle with twelve black spots on the elytra. The larvae work on a great variety of plants. Spray with arsenate of lead.

Winter Blight or Downy Mildew.—Attacks nearly all of the plants of this family, killing the leaves and injuring the tubers. Plant clean seed. Disinfect doubtful seed with formalin. Spray plants with Bordeaux as soon as symptoms first appear.

Root and Stem Rot.—Causes a "damping-off" of seedlings. Also attacks the tubers of potatoes, the subterranean parts of the tomatoes, and the fruits touching the soil. Apply lime to aerate the soil. Rotate crops.

Dry Rot of Potatoes, Wilt of Tomatoes, Wilt of Egg-plant.—All of these diseases produce a wilt upon the host plants, affect the roots, and may even cause a "damping-off" of seedlings. Treat seed with formalin before planting. Keep weeds out of fields in winter. Rotate crops, so as to have clean soil each year.

Early Blight.—A typical leaf-blight causing brown spots to appear on the foliage. Affects potatoes, tomatoes and daturus. Spray with Bordeaux when the plants are six inches high and repeat with three applications two weeks apart. Treat seed with formalin before planting. Rotate crops.

Potato Scab.—Produces large rough blotches on the tubers. This disease cannot be dealt with while the plants are growing. Great care must be exercised in the matter of seed selection. Treat all seed of doubtful origin with corrosive sublimate. Rotate crops so as to keep the soil fresh.

### Squash, Pumpkins, Cucumbers, Melons, Etc.

Melon Aphis.—Attacks all parts of the vines and is usually accompanied by a black smut, which grows upon the honey-dew secreted by the louse. Spray with kerosene emulsion or tobacco washes.

Green Lady Birds, Striped and 12-Spotted.—The larvae and adults of these beetles destroy flowers and foliage of the plants and gnaw the rinds of the fruit. Methods of control are as follows:

Repellants.—Dust with tobacco dust or with naphthalene. Soak lumps of gypsum in a mixture of kerosene and turpentine and place them under infested vines. Insecticides—Dust with lime and then spray or dust with Paris green or arsenate of lead.

Squash Bug.—Hand pick early in the season; also pick off eggs and destroy. Eggs are deposited in clusters on the leaves when the vines are very young. Trap bugs by laying boards loosely on the ground under which they crawl for protection. If very troublesome, a repellent of gypsum saturated with kerosene scattered about the grounds is effective. As soon as crop is harvested, gather and burn vines. Do not allow weeds to grow on the ground during winter months.

Downy Mildew.—Disease first appears in the center of the vine and spreads outwardly. Spray with Bordeaux to which is added one gallon of sulphurous acid to every 100 gallons of spraying material. Repeat every ten days.

Leaf Blight.—Produces spots on the leaves which spread very rapidly. This disease hastens ripening, injures production and destroys the quality of the fruit. It particularly affects cantaloupes.

Destroy affected plants as soon as they first appear. Spray often with weaker Bordeaux. Rotate crops.

Anthracnose.—Forms circular dead spots on the leaves and long shrunken areas on the stems. The fruits of the watermelon are often badly spotted by this disease. Spray with weaker Bordeaux as soon as fungus appears.

Common Wilt.—Produces a sudden wilt of the vines by stopping up the water carrying vessels of the stems. Destroy infected plants as soon as infection appears.

Fusarium Wilt.—Can be handled only by crop rotation.

Powdery Mildew of the Cucumber.—Attacks other members of this group also. Forms a white powdery coating on the leaves and stems and soon kills the plants. Spray as soon as it first appears with weak Bordeaux.

### Celery, Carrots, Parsnips.

Celery Leaf-tyer.—Destroys foliage, and its presence may be told by the many leaves which are curled and fastened together by this insect. It is particularly bad in greenhouses. Spray with Paris green or lead arsenate not later than three weeks before marketing crops, because of the danger of poisoning. Hand pick.

Celery Blight, Early Blight.—Produces spots upon the leaves, causing them to turn yellow, to wilt, and finally kills them. This disease also affects parsnips, and usually appears early in the season. Spray early and repeatedly with weak Bordeaux.

Late Blight.—Produces rusty brown spots upon the leaflets which may rapidly spread to cover the entire foliage. Spray with weak Bordeaux throughout the season.

### Asparagus.

Asparagus Beetle.—Dust air slacked lime upon the plants when they are wet with dew. Apply lead arsenate dry. As a repellent spray with hellebore in water.

Asparagus Rust.—Attacks the bushy tops, producing black and red rust, the latter being the destructive stage. Keep the plants cut back until July 1st. Apply 150 to 200 pounds of sulphur, dry, per acre, three weeks after cutting tops and before rust appears. Make the applications in the morning when the plants are wet with dew, or first spray with weak Bordeaux.

### Corn, Sorghum.

Corn Worm.—Is hard to deal with because it works on the ear in the husk. It is best handled by the rotation of crops, late plowing followed by harrowing to destroy the pupae in the soil, and by planting crop as early as possible to assure rapid growth. (See page 31.)

Corn Root Aphis.—Attacks the roots, causing a dwarfing of plants in patches over the fields. Crop rotation is the most important method of control. Stir old corn ground thoroughly before planting it again to corn.

Smut.—Causes enormous enlargements of the kernels, producing large sacs of smut. Cut off and burn the first infestations. Treat seed with formalin before planting. Rotate crops.

Wilt of Sweet Corn.—Plants die by wilting due to the shutting off of the water supply. Select resistant stock. Treat seed with formalin before planting. Rotate crops.

## COMBINED INSECTICIDES AND FUNGICIDES.

It is found desirable at times to combat both the insect pests and the fungi at one application of the spray and for this a combination of the insecticide and fungicide is used. This results in a saving in the cost of labor and time spent in spraying.

### Carbolic Acid Emulsion.

Crude carbolic acid..... 5 gallons
Whale oil soap.....40 pounds
Water (hot) .....40 gallons

The forty gallons of water are first poured into the cooking kettle and allowed to boil. While the water is getting hot the whale oil soap is cut into fine pieces, so as to make it dissolve easily, and added to the water. When the soap is all dissolved in the hot water the carbolic acid is added, and all is allowed to boil for a short time to insure thorough mixing. The whole operation requires less than one hour. This makes about 43 gallons of rich stock solution. For spraying the stock solution is diluted one to twenty of water, thus making approximately 860 gallons of spraying material. The stock solution will keep indefinitely, but is preferable fresh. When diluted with water it makes a perfect emulsion and can be applied with any spray pump, since an agitator is not needed. When the stock solution is allowed to stand for some time it is best to stir it up before diluting it for spraying.

The resulting spray is very easily handled, it needs no agitation, no straining, is easily and simply made, does not rot the hose or rust iron pipes, and is perfectly harmless to the eyes and hands of the sprayers.

### Bordeaux-Arsenate of Lead.

Acid lead arsenate..... 3 pounds
Bordeaux mixture.....50 gallons

or

Arsenate of soda.....10 ounces
Acetate of lead .....24 ounces
Bordeaux mixture .....50 gallons

Prepare the commercial arsenate of lead by working into a smooth paste and add it to the diluted milk of lime. Prepare the

home-made arsenate of lead as follows: Take the arsenate of soda and dissolve this in a gallon of water (preferably hot) and in another gallon of water dissolve the acetate of lead. When completely dissolved pour the two simultaneously into the mixing tub containing the rest of the fifty gallons of water; stir well and the spray is ready. The use of wooden vessels is advised in handling these solutions.

Where a stronger poison is desired the arsenate of lead can be increased to three or four pounds. A more uniform distribution of the arsenate of lead is secured throughout the spray when it is added to the milk of lime instead of placing it in the spray tank.

**Bordeaux-Paris Green.**

Paris green..... 4 ounces
Bordeaux mixture .....50 gallons

Mix the Paris green into a thin paste and add to the milk of lime and proceed to mix the Bordeaux according to the directions given in Formula No. 1.

First mix the arsenate of lead with two or three gallons of water.

**Lime-Sulphur-Arsenate of Lead.**

(a) Lead arsenate (neutral by ammonia test)..... 3 pounds
Dilute lime-sulphur .....50 gallons

or

(b) Arsenate of lead ..... 2 pounds
Self-boiled lime and sulphur.....50 gallons

Have the arsenate of lead in the form of a smooth paste and add to the lime and sulphur solution, at the same time stirring the spray thoroughly. If a power sprayer is used it is advisable to keep the agitator working.

## WAYS TO FIGHT DESTRUCTIVE ANIMALS.

### Protecting Foliage.

*What will keep deer from eating the leaves and tender twigs of young fruit trees? Last year I set out* 1,000 *young apple and pear trees and the deer ate the foliage off three times during the season. This last spring I set out* 1,500 *more and the deer went at them about two weeks ago and last week they very nearly cleaned them all up. Do you know of anything that we can spray the foliage to keep them away?*

A spray which will keep chickens and rabbits from eating leaves will probably make them too bitter for deer. W. C. MacFarlane of Hanford advises as follows: "I asked for a remedy to prevent poultry eating the leaves and bark off the peach trees, and was advised to use a quassia chip solution. As I had handled quassia solution on a commercial scale, I felt sure that would answer the purpose, and it did. The fowls would seldom take more than the second bite. I used a spray pump and sprayed it on the lower part of tree and trunk. I made the solution as follows: Quassia chips, two pounds to one gallon of lukewarm water; let this soak forty-eight hours; strain off the liquid and add

one-half gallon of fresh water to the chips and boil down to one quart; draw this off and mix with the first water. You have then a solution poisonous to flies and insects, but, in small doses, not harmful to persons."

Another very bitter stuff is made in this way: One pound of commercial aloes to four gallons of water; mix and spray. Whale oil soap, one pound to four gallons of water would probably disgust any deer.

### Remedies for Rats.

*Please give some tested recipes for rat killing.*

Rags, saturated with carbon bisulphide, were put down the holes and the rats died, and after two years' time had not come back. If you can get the gases of carbon bisulphide near the rats they will surely die.

I used a few dollars' worth of all kinds of poisons, but the rats didn't eat it at all. I had a white Spitz dog, who one day was scratching around the woodpile, and I helped him. We got five young and one old rat. After that I dug around everywhere. I found a hole and he got, in three days, over eighty rats. One afternoon I took all the hay out from the barn, and he got over fifty rats in about two hours.—Joseph Schatzeder, Santa Rosa.

I took a few small eggs, punched a little hole in the side of each, and put in a small quantity of strychnine, two or three crystals is quite enough. For about a fortnight they took the eggs every night, then they began to leave them, and in three weeks there was not a rat on the place, and ever since they have given this place a wide berth. I tried all kinds of traps and poisons; traps they avoided, and poisoned bait they wouldn't touch, but eggs, no matter how much you handle them, they never refuse. Wherever this remedy has been tried it has proved effectual. The eggs must be placed in their runways out of the reach of dogs, as they also are fond of eggs.—Sam'l Haigh, San Jose.

Feed rats dry meal for about one week, always feeding them in the same place, and having plenty of water near by, and then add about one-quarter as much plaster of Paris, feeding for the same time and at the same places with plenty of water near, and no rats can live. The plaster and meal must be well mixed and the meal should be very fine. The plaster "sets" in the alimentary canal and the rat soon dies.—W. H. Konkel, Kerman.

We placed hot savory table scraps where rats would get them, increasing the amount if it was all eaten, for four nights, to get all of them interested. On the fifth night, plaster of Paris was added to a big moist meal and the rats froze in their tracks not more than three or four feet away. The rising generation were disposed of a little later.—Arthur Walton, Yucaipa.

Buy a cheap sponge, cut it into small pieces, and fry it in grease. The rat being of a hungry and greedy disposition will swallow it whole, as he can't chew it, then the sponge will expand and swell up and the result will be a death from constipation. I have tried it with good results.—A. Rensch.

Poison some fresh meat with arsenic and place the poisoned meat near a dish of water. I have used this system with good success.—J. E. Thorp, Stockton.

A sure way to kill rats is to get some Victor rat traps and bait them with dried French prunes. The trap costs 15 cents. I have tried different bait, but the dried prune is the only sure way.—C. A. Iverson, Paso Robles.

### Walling-Out Gophers.

*I am growing alfalfa with a sprinkling system with network of pipes as the land is gravelly and porous and it is impossible to flood to drown the pests. I have had a fairly good stand, but in spite of cats and traps the alfalfa is riddled with gopher holes, which are destroying the roots. I have thought of putting a rock and cement wall around the alfalfa field, going four to six feet deep and two feet above ground. Can gophers go deeper than this? There is plenty of rock on the place and we can do the work ourselves. Has this ever been tried?*

You will surely get no gophers to speak of from the outside if you build such a wall, but it will be fiercely expensive in digging and masonry even if you do all the work yourself. We believe that gophers do not go as deep as four or six feet. We cannot find record of any extreme depth found by those who have studied burrows by abundant excavation, but they are said by all investigators to be shallow and only a little deeper for housing purposes. Few if any would dig under a wall half the depth you mention. They do surface running at night, during the mating season, but probably a one-foot barrier would stop that. If you build one foot above ground and two feet below you will practically have them shut out.

You can also protect your place very largely by digging a ditch with vertical sides two feet deep all around it and keeping that ditch open. Dig the width of a coal oil can and bury cans even with the bottom of the ditch at intervals of twenty-five feet. Digging gophers will take headers into the ditch, run along the bottom of it until they plump into the oil cans, from which they cannot climb out. Such pitfalls have been considerably used and captures of gophers by the hundreds have been reported. Cats have also been seen to help themselves from the cans—so you can have a combined ditch, can and cat system which will work automatically. If in addition to this protection you get the knack of using traps to catch those now inside the patch, you may get a little rest and more alfalfa.

### Poisoning Gophers.

*Are there any newer and better ways with gophers?*

Take a narrow pine board which will split easily and straight and saw off blocks sufficient to make, say, from 100 to 1,000 "toothpicks" about three and a half inches long. I sharpen both ends of each "pick." Next, I put a raisin (into which I have pricked a little strychnine) on one end of pick and place in a tight fruit-jar labeled "Poison." These I keep in stock. I carry in my vest pocket, in a suitable receptacle, about twenty of these impaled raisins. When I discover an open hole I simply plant the sharpened end of the pick into the side or roof of the hole, and the gopher cannot help but see it, and nineteen out of twenty will eat it and die. I put one into each opening.—J. H. Hubbard.

The chief requisite for poisoning is to get the baits into the main tunnel. If left in the lateral, where the gopher is working, the baits are frequently pushed out with the soil, to be wasted, or possibly become a source of danger to birds or other animals. Baits made of pieces of potato, carrots, beets, raisins, prunes, shelled corn, and green alfalfa have all been used with success. Baits of the first materials should not be larger than a hulled walnut. The first five are prepared by cutting a slit in the bait and inserting some strychnine sulphate, about equal in bulk to half a grain of wheat. To prepare the grain or alfalfa, soak in a solution prepared as follows:

Dissolve one ounce of strychnine sulphate in a quart of boiling water, add a quart of thick sugar syrup and stir thoroughly. This formula is sufficient to poison thirty-five pounds of grain, or thirty pounds of green alfalfa. In treating alfalfa, add a little more water. If a little borax is added to this syrup it will keep for several months.

To locate the main tunnels, force a pointed stick into the ground at a point midway between the last fresh openings. The poison may be dropped through the opening made by the prod. This saves the labor of digging for the burrow.

The ordinary gopher traps are usually effective when set in the freshest openings. After setting the traps, the opening should be closed or left with only a little light entering.

On land that can be readily flooded, the gophers will be driven to the surface where a small dog will make short work of them.—W. B. Parker.

## Killing Squirrels.

Ground squirrels live in burrows which are, in the majority of instances, not more than eighteen inches to two feet below the surface of the ground, and run in general more or less parallel to the surface. In some cases burrows may go deeper.

Female ground squirrels have usually not more than one litter of young in a year; the number of young in a litter varies from four or five to a dozen or more—the average is about eight. The breeding season begins in November and continues for several months, the young being born between March first and June first; this period varies somewhat in different localities.

When the young are six weeks to two or three months old they either leave the burrow in which they were born or are driven out by their parents, and open burrows for themselves in some other locality. The nearness of the new burrows to the place of birth will depend upon how numerous other squirrels are, or upon the location of a desirable food supply.

Poison for Squirrels—Barley is the best kind of grain to use. Wheat, oats and other grains have been used, but extensive observation has proved that more uniform and better results have been obtained by the use of barley than with any other grain. Further, it is not so likely that it will be eaten by chickens, quail, pigeons, doves, turkeys and other birds or fowls, nor by sheep or other animals, as

will other kinds of grain. The best poison to use is strychnine, the barley being coated with it in accordance with the "Government formula," as follows.

| | |
|---|---|
| Whole barley (recleaned) | 18 lbs. |
| Strychnine sulphate | 1 oz. |
| Soda (bicarbonate) | 1 oz. |
| Saccharine | 1 oz. |
| Thin starch paste | 1 pt. |
| Corn syrup (Karo or equal) | 2 ozs. |

The best results are obtained by scattering the poisoned grain on the ground early in the morning, back of the hole. Not upon excavated dirt that the squirrel has thrown out. It should not be spread before a rain or when the ground is wet or when there is a heavy dew, as the poison will be washed off and no results obtained. It should be widely scattered so that the squirrel will be compelled to pick it up a grain at a time and place it in the cheek pouch.

Fumigating Squirrels and Gophers.—When the soil is moist excellent work can be done with the fumes of carbon bisulphide or "kilmol." A ball of waste jute or gunny, cotton, horse manure, oak ball, or other absorbent material is saturated with kilmol or carbon bisulphide and placed in the mouth of the squirrel burrow; the hole may then be closed with dirt and the gas allowed to diffuse throughout the burrow. This will be sufficient in many instances; as a general rule, however, it is better to ignite the ball with a match or torch. A sharp explosion usually occurs immediately, which forces the burning gas deeply into the burrow. The burning of the bisulphide produces sulphur dioxide and carbon dioxide, both of which are poisonous if breathed for a sufficient length of time in an inclosed space. Kilmol, when ignited, also produces sulphur dioxide and carbon dioxide and contains other powerful irritants in addition which set up a violent inflammation in the lungs of the squirrel, so that the effects are severe and lasting.

The waste ball method is applicable only when the ground contains sufficient moisture to prevent the formation of cracks and crevices through which the poisonous gases could escape. There is also danger of fire where the vegetation is dry enough to burn.

The Squirrel Destructor.—The squirrel destructor is an apparatus for forcing poisonous gases into the squirrel burrow. It is constructed principally of galvanized iron, and is simply a double action air pump which forces air through a chamber into which one ounce of kilmol or refined carbon bisulphide has been measured. Forty strokes of the pump forces thirteen cubic feet of air through the liquid used, thus forming a vapor which displaces the air in the burrow and remains for several hours. The squirrel promptly becomes unconscious and dies in from twenty to thirty minutes to forty or forty-five minutes, depending upon the liquid used and upon the tightness of the ground surrounding the burrow.

The squirrel destructor is usually effective against gophers. In some cases, however, the gopher will plug his burrow and thus escape

the poisonous gas. It is desirable to put in a double charge and pump twice the ordinary number of strokes.

Sulphur-Balls for Gophers—Fred Lewis of Santa Clara County suffocates gophers with sulphur balls made by tieing a couple of tablespoonfuls of dry sulphur in a dry cloth. He digs beside any fresh mounds, lights a sulphur ball with a match, being sure it is burning; pushes it into the hole, blows across it to force smoke out of any other holes to that burrow which may be open, so that he may cover them up; then covers all openings; smoothes down the dirt so if the gophers live through the smudging he will know it by fresh piles, and proceeds to the next. Sometimes the smoke comes out of five or six holes at once, but after closing these he has never known a gopher to dig out.

## Baits and Poisons for Coyotes.

*I wish to know a good recipe for coyote bait or scent.*

One of the most common scents is made by cutting up a fish which is rich in oils, such as trout or eel, into small pieces and putting these in a corked bottle. When this is placed out in the sun it gives off a rancid oil with a very odorous smell which wild animals like.

Another good scent is made by putting common angle worms in earth which is saturated with milk. In order to prevent the worms from escaping, a boxful of earth should be used. After the worms are bloated with milk put them in a corked bottle in the sun until the mass has decomposed.

Skunks are also considered to be good scent, as coyotes will follow the scent of them for miles, and when they find it, will always lie down and roll on it.

Any kind of meat is good for bait, but of all fresh meat, liver is the best. Rabbits, squirrels, and doves are also good. Kill them and insert poison while the body is warm so that it will circulate through the system. Fresh meats of any kind rarely give the same satisfaction as dried meats, for the reason that buzzards, hawks, and other birds of prey detect it, and oftentimes carry it off.

When dried bait is used, which is no doubt the best of all, it must first be sprinkled with poison or insertions of poison made in it, then it should be hung in the sun to dry thoroughly.

This kind of bait can be carried easily and placed almost anywhere without being molested by the fowls of the air and will keep for months if placed in a dry location.

To poison a hog pasture the best method is to bore a hole one inch in diameter and three inches deep on each side of several 4x4 inch blocks. Take equal parts of tallow and lard, melt just enough to make it run together; add poison, and pour into the holes. Place these blocks in different parts of the field where coyotes are accustomed to prowl and you will get them. If possible, roll a dead skunk over the blocks or put them on the trail where a dead animal has been dragged. This is also a very good way where birds, hawks, and buzzards steal baits.

When all means of trapping and poisoning have failed to get a coyote which is raiding poultry, take a chicken—a white one is best, and a sick one, too, for that matter—pull a few feathers out of its back, sprinkle pulverized strychnine in the place, and stake it out by the leg. The chicken will usually live long enough to capture him. If this is too cruel, place a small chicken coop inside of a large one, equal distance from all parts, and fasten securely. Then put several chickens in the small coop—one or two crowers are the best. Take the coops and chickens to a place frequented by coyotes, place traps all around the coop, cover and leave them until you catch your thief. It may be several days, but feed the chickens and leave them there and you will get the varmint.

Strychnine is the most effective poison for coyotes and should be used sparingly as it does not require much to kill.

If they start to eat a bait and it is too bitter with poison, they will drop it from their mouths. Enough pulverized strychnine to cover half an inch of the point of the small blade of a pocket-knife is enough to put in each bait.

The best time to poison is when coyotes prowl about in packs, as they eat nearly everything they can find. The reason of this is that several discover the bait at the same time, making a rush for it, and the first one getting it eats it in haste, without suspicion, to keep the others from it.

The carcass of a young calf makes excellent fresh-meat bait. Drag it about the field on horseback before poisoning, then put the poison in the ears, mouth and chest. Unless there are quite a number, they will eat only part of it the first day, usually commencing with the flank and devouring the hind quarters. This will not kill them, so encourages them to come again, and perhaps bring others with them. You will likely get several, as they eat nearly everything of a young calf, even the head.

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